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INCLUDING

How to figure the ROI

How to sell your board

Who has the best tools

Page 56

SPECIAL REPORT**THE TRUTH ABOUT
CYBERTERRORISM**

Page 66

**PLUS YOUR INCIDENT
RESPONSE TOOLKIT**

Page 74



**Kevin Murray, American
International Group's
CIO, showed his board
that legacy modernization
was cheaper than
maintenance.**



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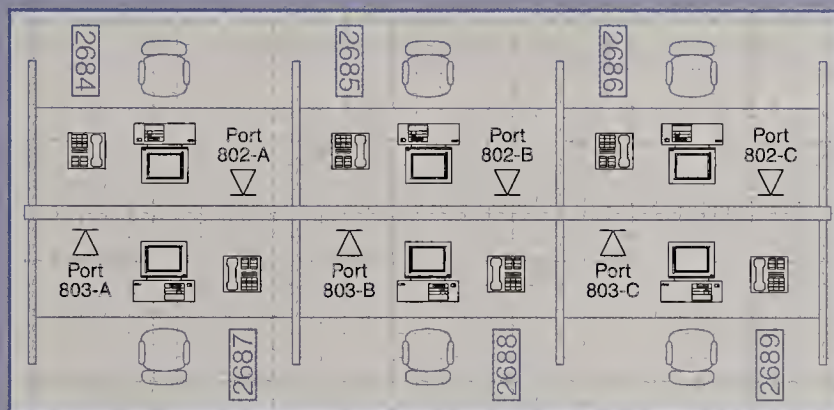
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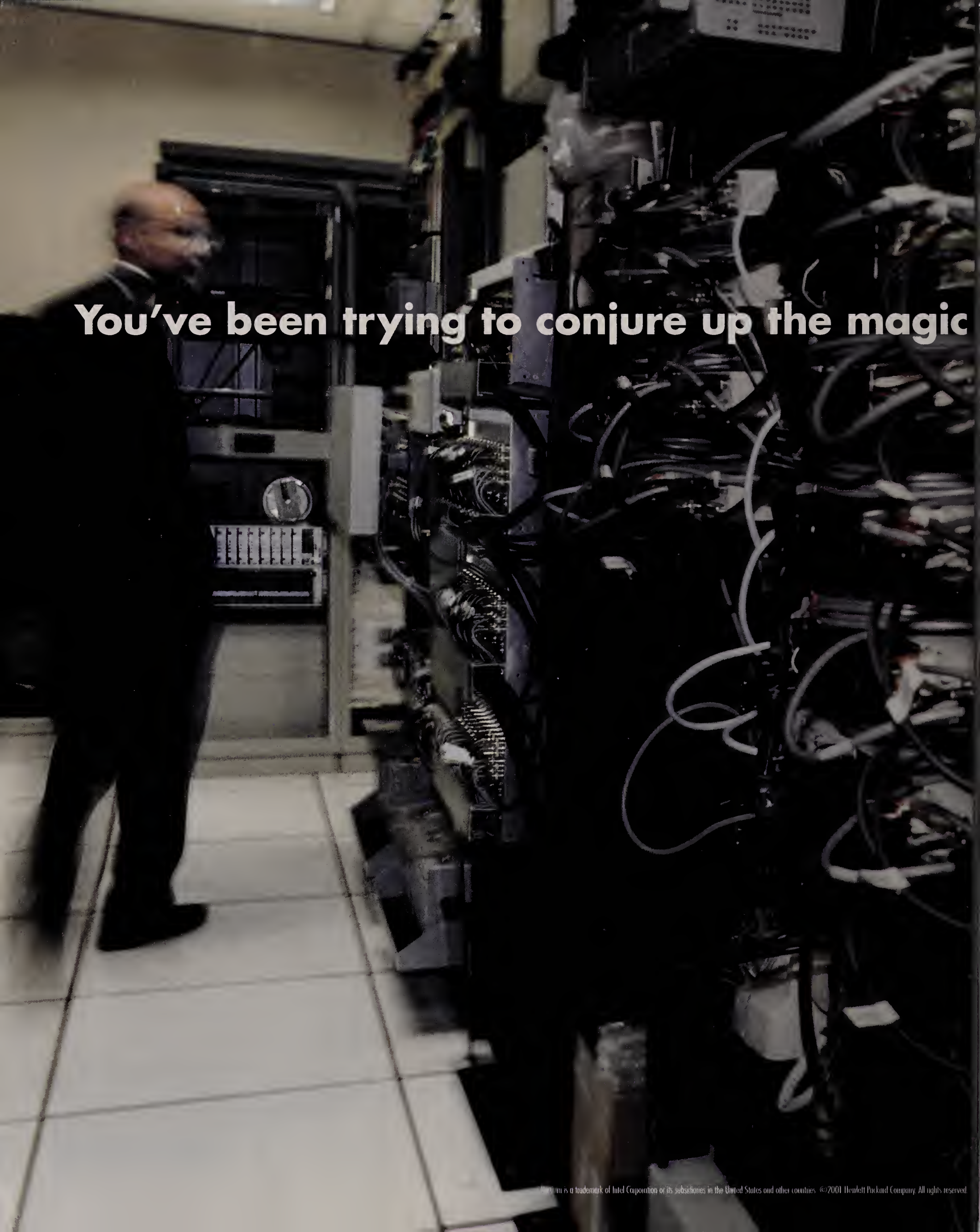
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Cover Story

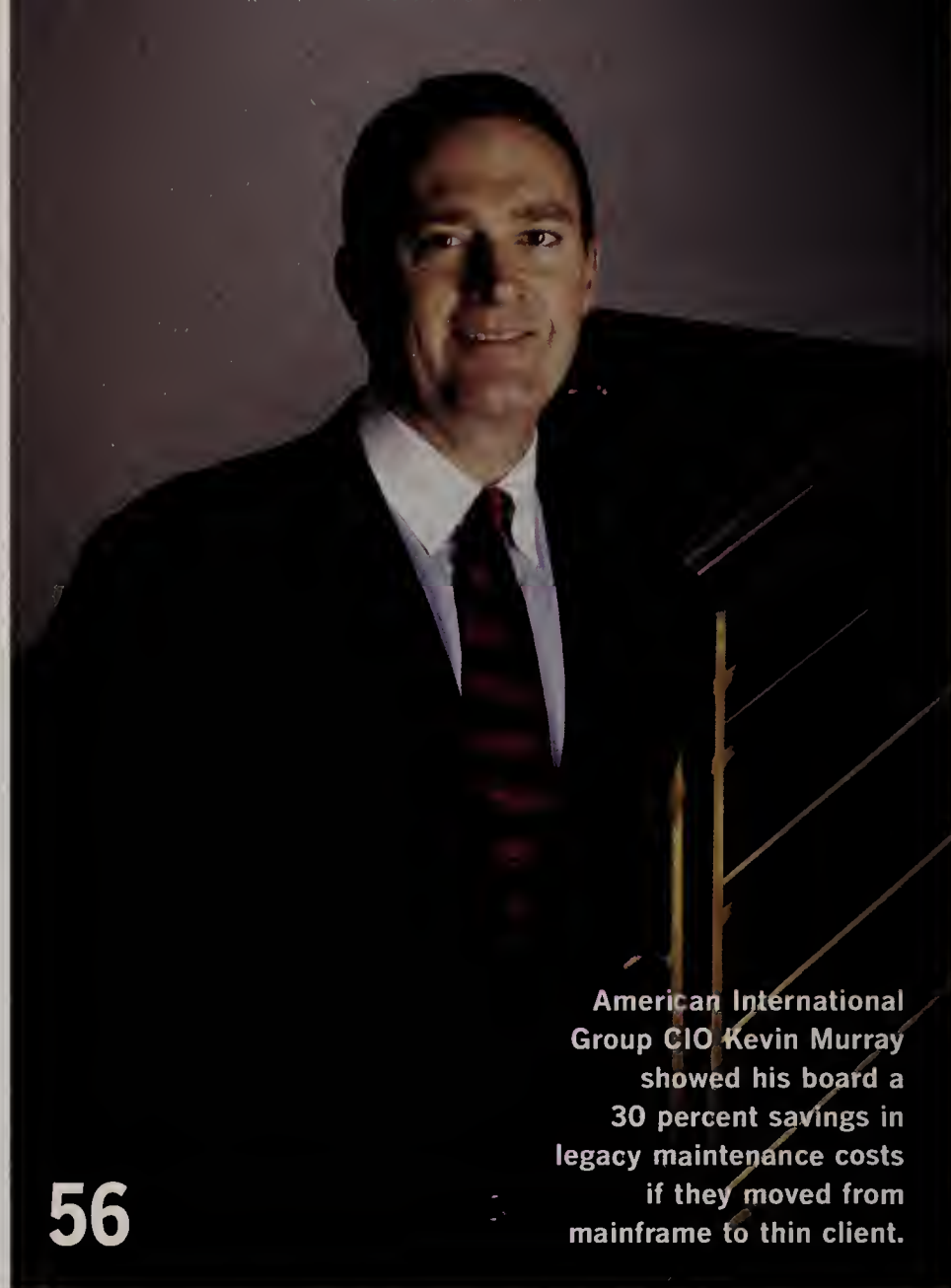
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Pull the Plug on Your Legacy Apps

Despite the sluggish economy and uncertain business climate, right now is the perfect time to tear down your legacy applications and start over.

By Simone Kaplan

COVER PHOTO BY ANDREW KIST



American International Group CIO Kevin Murray showed his board a 30 percent savings in legacy maintenance costs if they moved from mainframe to thin client.

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The Truth About Cyberterrorism | 66

The real threat is to critical data, not to property. That's what CIOs should be focusing on. *By Scott Berinato*

How to Plan for the Inevitable | 74

Think you can't afford to create an incident response plan? Think again. Here's a budget-conscious guide to getting started.

By Sarah D. Scalet



"To us, cyberterrorism is a lower-level threat," says Marcus Kempe, director of operations support for the Massachusetts Water Resource Authority. "Could a computer attack get us to a high-consequence event? Probably not." Page 66

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Automating your workflow, knowledge management and billing processes can work only if employees and managers are on board ahead of time. Otherwise you're just wasting your time and money.

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Tech-savvy schools like to share what they know—but only if you learn how to ask. *By Ben Worthen*

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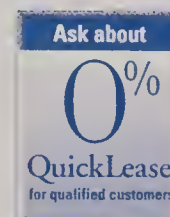
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Companies need to use technology for long-term business advantage while making short-term cost cuts. *By Tom Davenport*

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Managing the Unexpected and *Developing Global Executives*; Book Talk; CIO Best-Sellers



"Most organizations need a bifocal strategy with enterprise IT—short-term cost reduction and long-term competitive positioning. Of course, bifocals can initially be disorienting."

—Tom Davenport, CIO columnist Page 36

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Your Guide to Managing

Strategic Planning

CIOs have two important parts to play when it comes to strategy—and they're not easy. *By Mark Gordon*

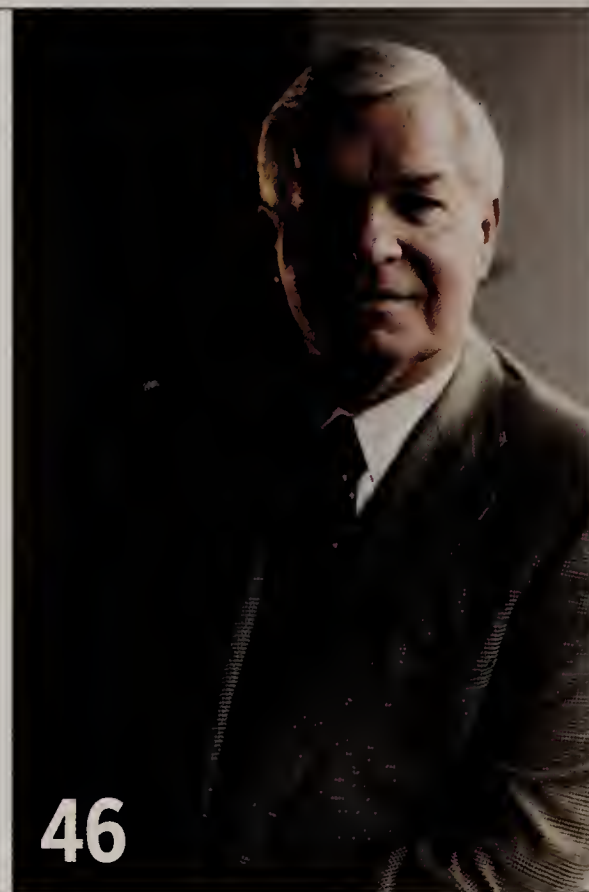
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If Marriott CIO Carl Wilson hadn't been involved in strategic planning for CRM, he might have "messed it up," he says.



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Courage

CIOs need to be more aggressive, confident and brave. *By Abbie Lundberg*

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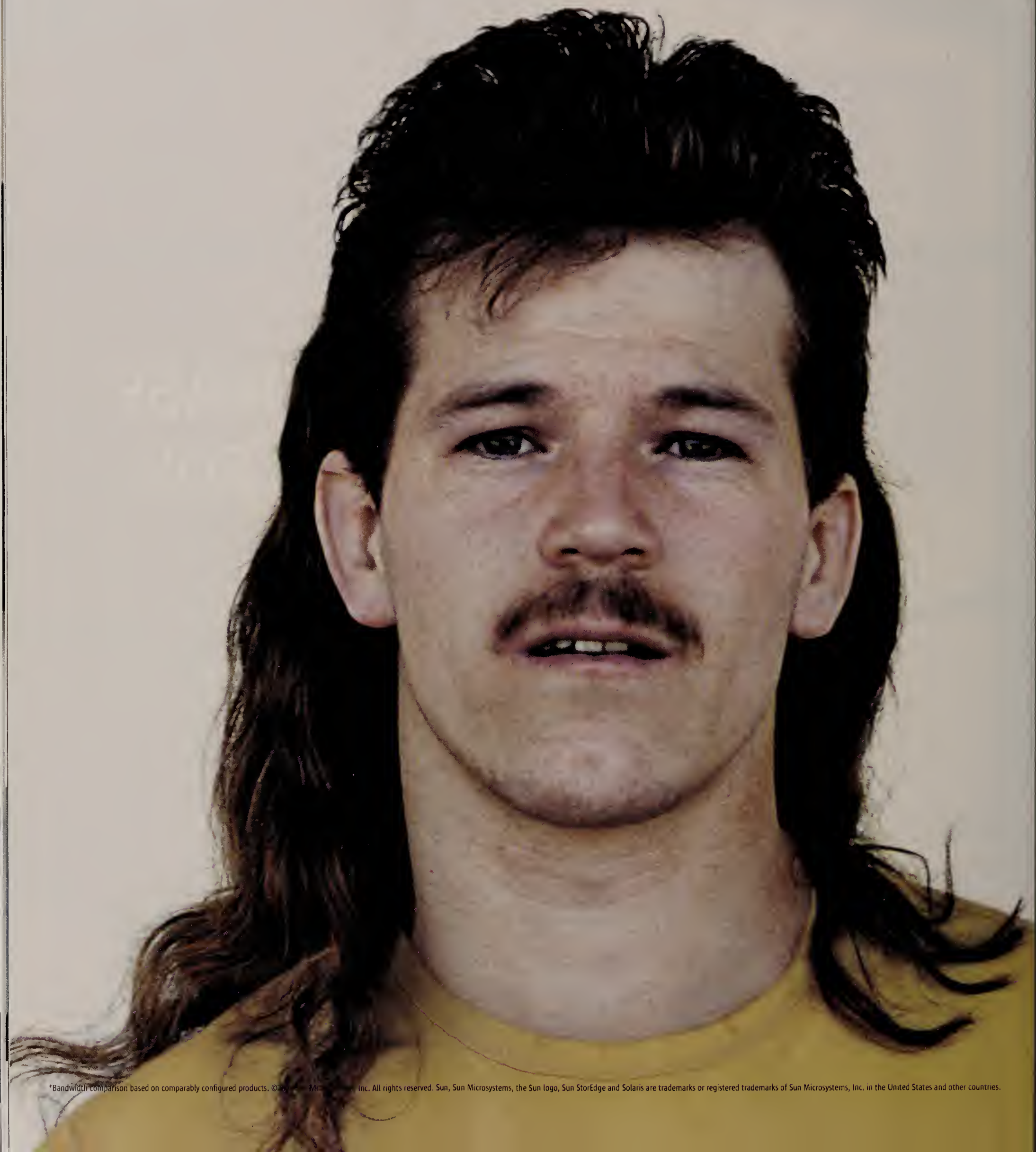
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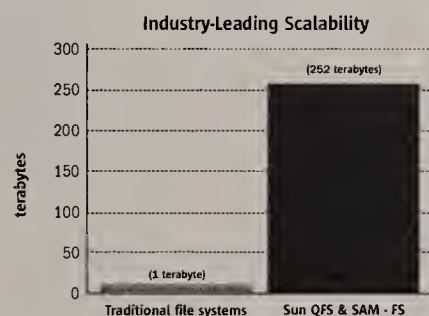
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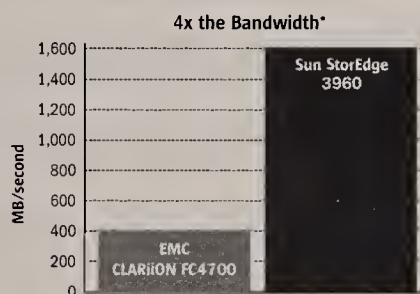
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Marcus Kempe,
director of operations
support, MWRA

WEB >CONNECTIONS

Find these stories and other resources in the Web Connections box at www.cio.com.

LEARN MORE

Debunking the threat to utilities

In "The Truth About Cyberterrorism" (Page 66), Senior Writer Scott Berinato explores what's real—and what isn't—about the threat of cyberterrorism. As part of his reporting, Berinato got an in-depth look at the Massachusetts Water Resource Authority's IT security with Director of Operations Support **Marcus Kempe**. Read his account by going to the Web Connections box at CIO.com.

WEIGH IN

How do you get user buy-in?

Whether you're implementing professional services automation software ("RoboBoss," Page 84) or making big changes ("Quick Change Artists," Page 92), it's money down the drain if the people who are supposed to use the new system don't. Share your secrets for aiding adoption—early and otherwise.

CIO Reader Poll

Can remote conferencing technologies replace the face-to-face meeting?

As this issue's **World View** column (Page 43) points out, before Sept. 11, if a meeting was really important, you had to be there. After Sept. 11, the travel picture has changed. Are videoconferencing and its allies suitable replacements? Weigh in at www.cio.com/readerpoll.

What's New in the Security Research Center

Responding to security problems

NEW SECTION Do you know what to do when you've been hacked? The new Responding to Problems area features the **CIO Cyberthreat Response & Reporting Guidelines**, a collaboration among industry professionals, law enforcement and *CIO* magazine for dealing with computer security incidents. Also included are resources for what to do after an incident and lists of agencies to contact. Go to www.cio.com/security.

Enron IT—a tale of excess and chaos

ONLINE EXCLUSIVE Enron spent money on IT like there was no tomorrow. And now there isn't. To read the IT angle on the Enron debacle, check out www.cio.com/security.

Our Daily Web

MONDAY Tech Tact

Technology Editor Christopher Lindquist covers what's coming and what it's good for.



LINDQUIST

TUESDAY CIO Radio

Web Writer Danielle Dunne talks with the experts.

WEDNESDAY Metrics

Web Writer Jon Surmacz finds the industry numbers that matter.

THURSDAY Sound Off

Read the column that takes a stand on managerial, political and ethical



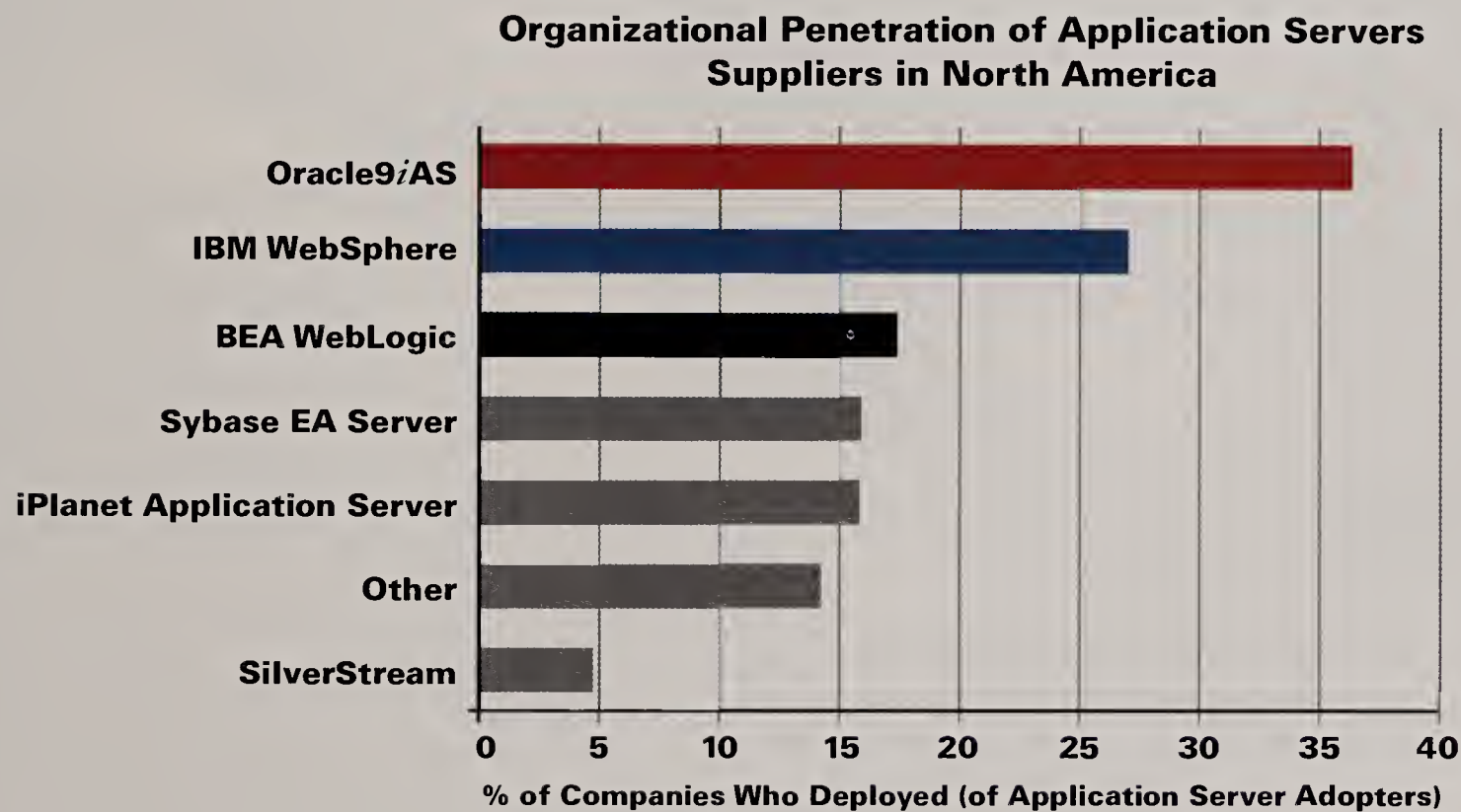
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dilemmas that confront CIOs daily.

FRIDAY 35 Cent Consultant

Executive Editor Derek Slater gives advice worth the price.

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From the Editor

lundberg@cio.com



Want to hone your leadership skills? Visit our Leadership and Management Research Center at www.cio.com/leadership.

Courage

I was in Austin, Texas, for the last couple of days, primarily to speak at a conference on homeland defense and critical infrastructure hosted by the Texas attorney general's office. While I was in town, I hosted a breakfast for some of our Austin-area readers.

There were about a dozen of us, and the conversation was so good I thought I'd share some of the highlights.

We talked a lot about leadership and the ability of CIOs to deliver value, and the discussion took some interesting turns. For one thing, a number of CIOs expressed the belief that technology itself had more or less plateaued—that things from a technological standpoint were getting easier and becoming more stable. So CIOs have an easier time with the service part of their job, providing “dial tone” and applications to support the business as it exists today. This is giving them more time for the business leadership part of their job, and with CIOs that generally means thinking about how IT can transform things.

At the same time, there appears to be a backlash within their organization to all the hype that's been dished out by high-tech vendors during the past five years. CEOs and other executives who bought in to the hype have become jaded and skep-

tical of even the most reasonable of value claims—especially when it involves transformation. Consequently, CIOs themselves must increasingly don the mantle of marketer and find a way to sell the real value of what this stuff can actually do.

Together, these two trends add up to one conclusion: To succeed today, CIOs need to become “more aggressive, confident and brave,” as one CIO put it. They need to be creative and engage their business partners' imagination about what the future might look like. And they need to be willing to confront people—to really fight for what they know to be true. To sit back and just assume a service mentality is to shirk responsibility.

This means staying with one job for much longer than the current average. “CIOs need to stick it out and fight the fight,” said one CIO.

“Longevity helps,” agreed another, who described his initial four years of struggling to be heard and making little headway, but through perseverance, the tide turned, with the next four years bringing significant progress (and some really impressive results).

It sounds to me like the profile of a successful CIO in 2002 is more like that of an explorer or a revolutionary than a servant or technician. It takes confidence, endurance and real courage.

Allie Lundberg

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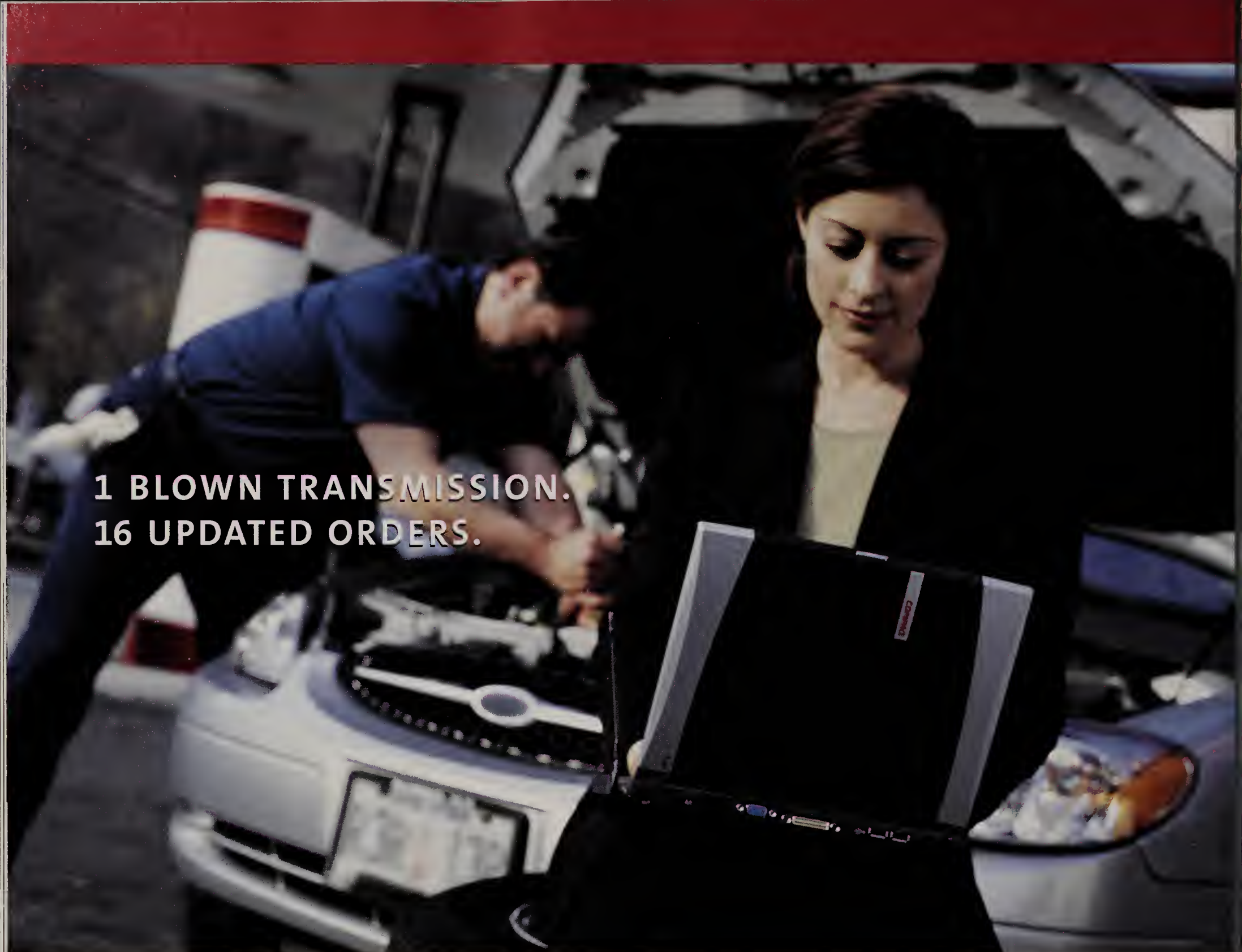


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Reader Feedback

SEIZE THE NET

A friend pointed me to Anthony Townsend's "Take Back the Net" article in the Dec. 1, 2001, issue. I would add that the Net wasn't "taken" from us, we gave it away. It's the lack of innovation and entrepreneurial activity on the part of the people with money that has really hurt. By "entrepreneurial," I don't mean pouring investment dollars into the latest hot trend, although that's what some people appear to think it means. I mean taking a solid concept that's new and different and making it work. My friends, if you want to "take back the Net," and I truly hope you do, then get off your butts and do it.

Bob Adams • Exec. Dir., Global Community Ctr. • Washington, D.C. • bob@globaldevelopment.org



FREE AT LAST

I want to share my experience with Linux ["How to Run a Microsoft-Free Shop," Jan. 1, 2002]. We are a consulting company, mainly focused in IT services around Lotus Notes and Domino. Our employees all have an IBM ThinkPad laptop, and some of them have a PC workstation in the office. We successfully switched all our servers to Red Hat Linux and are currently switching our clients to Linux as well. Most of the software or tasks we do on a daily basis are available on Linux, but there are still some applications that we can't find an adequate replacement for.

We started to use OpenOffice as a Microsoft Office replacement. We are very happy to see that we can read and

modify all of our WinWord documents without any problem. Some of them need small changes after opening them in OpenOffice, but this is not a big deal. We find Linux in a very mature state. Even IBM internally is looking at Linux. None of us have completely switched to Linux on the desktop. We just started to look at it, but we are still not where we want to be. The main reason that we are not 100 percent converted to Linux is the lack of know-how and the missing applications that we need.

Stevan Bajic
CEO

Vision Unit GmbH
Zug, Switzerland
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I would love to be Microsoft free but I cannot see other servers or printers. The bottom line is that Red Hat has to make a better effort to get the workstation installation to work right without becoming a full-time hacker.

Documentation is almost nonexistent on how to set up a workstation that really works and is actually part of a network. What Red Hat and Mandrake seem to forget is that even though Linux is not Windows, one reason why Windows dominates the market is that installation of a Windows

95, 98 or NT workstation is a quick and simple process. A half hour's work and the thing comes up, opens its eyes, sees the network, logs on to the network, makes it easy to install printers, maps drives (create mountpoints) to network resources, and is ready to go. My two experiences so far have been akin to delivering a nice looking baby that can't see or hear.

Dave Harman
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CLARIFICATION A story describing CIOs' reactions to Microsoft's new licensing practices ("The Meter Is Running," CIO, Jan. 15, 2002) spelled out a number of licensing options available to CIOs including one option known as the Enterprise Agreement. Our story explains that customers who opt for an Enterprise Agreement enjoy software discounts while agreeing to use only Microsoft products and not install competitive products. In fact, Microsoft officials say, the language of an Enterprise Agreement does not preclude customers from buying and using competing products. The agreement does, however, require customers to pay a license fee for every desktop in the enterprise, even if customers decide to use an alternative product.

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DATA MODELING

Method to the March Madness

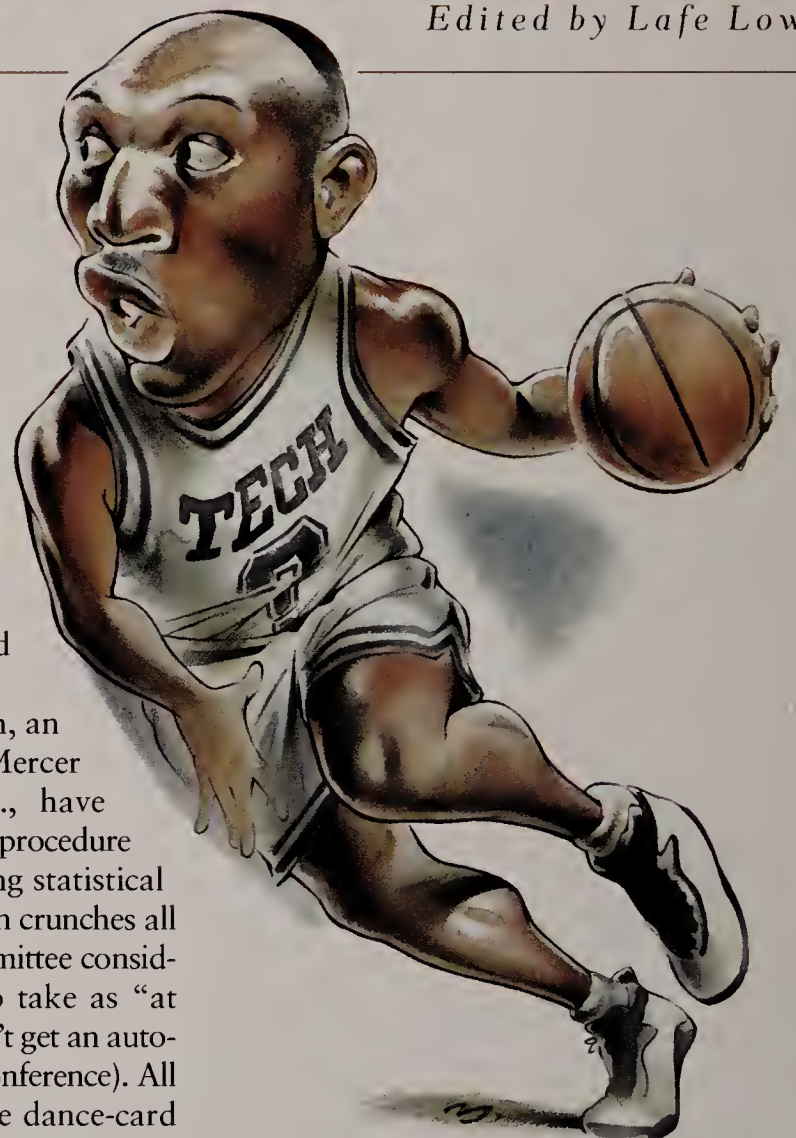
By Eric Berkman

DIE-HARD COLLEGE HOOP FANS always mark their calendar with a fateful day in March known as Selection Sunday. That's the day the NCAA Basketball Tournament Selection Committee unveils the 65 teams fortunate enough to be invited to the big dance—the NCAA playoffs.

Every year it's full of controversy. There's always a team or two that thinks it got cheated, and the committee's deliberations are shrouded in secrecy. While the factors the committee is *supposed* to consider are public knowledge, no one knows exactly how it arrives at its final decisions. Jay Coleman, an operations management and quantitative methods professor at the University of North Florida in Jacksonville,

is trying to bring some method to the March Madness.

Coleman and Allen Lynch, an economics professor at Mercer University in Macon, Ga., have derived a statistical modeling procedure called the Dance Card. Using statistical software called SAS, Coleman crunches all the factors the selection committee considers when it decides who to take as “at large” teams (teams that didn't get an automatic bid by winning their conference). All this data is plugged into the dance-card equation, which produces a “power index” figure. Coleman then ranks the teams by power index and determines which should make the cut.



Coleman used this model to predict the past two tournaments. In 2000, it correctly predicted all but three spots. In 2001, it missed only one. “The committee chose Missouri, and we picked Richmond,” he says, “but after the selections were made, most commentators said Richmond was the one team that got the shaft.” He also analyzed all the selections from 1994 to 1999 and found his model would have correctly predicted 94 percent of the available at-large bids during that time.

Coleman believes this type of statistical modeling also applies

Continued on Page 26

Department of **BIG,** Scary Numbers

5,915: Total number of seats on the boards of directors of Fortune 500 companies
735: Number of seats held by women serving on boards of Fortune 500 companies (up from 685 out of 6,120 in 1999)
434: Number of Fortune 500 companies with at least one woman serving on the board (up from 419 in 1999)
10,656: Total number of seats on the boards of directors of Fortune 1000 companies
1,158: Number of seats held by women serving on boards of Fortune 1000 companies (up from 1,108 out of 11,085 in 1999)
737: Number of Fortune 1000 companies with at least one woman serving on the board (up from 729 in 1999)

SOURCE: CATALYST

A photograph of a person walking across a wooden bridge in a forest. The scene is captured during sunset or sunrise, with warm, golden light filtering through the trees. The bridge has a wooden railing with vertical posts and horizontal rails. The person is walking away from the camera, towards the right side of the frame. The forest is dense with tall evergreen trees. The overall mood is serene and peaceful.

.....

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March Madness

Continued from Page 24

to a business context. "Anytime you have a binary variable—either you're in or you're out, or in a business context, you decide to fund a project or not—this could be applied," he says. "This system can take major criteria in a decision and at least estimate what kind of weight each of these criteria received in the decision, and that's valuable information." Coleman's next project might be to tackle college football—deriving a better model to determine who makes the Bowl Championship Series.

WEB POLICY

The Dark Side of the Web

SEX, DRUGS, GAMBLING—it's all in a day's work for Harold Kester. He spends his days surfing the Internet for websites dedicated to pornography, racism and online gaming—sites that would get the average employee fired in a second.

As the CTO of Websense, a San Diego-based Web filtering software developer, Kester's job is to examine suspicious sites submitted daily by its clients. He and his staff classify sites according to 28 different languages (including Urdu, a language widely used by Muslims in Pakistan and India) as well as 78 content categories such as racism and hate, sex, gambling, violence, drugs and weapons. The newly categorized sites are entered into a master database, which can then block certain categories.

Content management is old hat for Kester, the former CTO of Encyclopedia Britannica. "I've been looking at text classification for 17

years, and this is the most interesting application I've had for that background," he says.

That doesn't make it easier to look at some of the things he sees. Some are truly strange, while others are deeply disturbing. "There was the site for people who are addicted to Chapstick," he recalls. "Then there were the sites for people who are sexually interested in feet, stuffed animals, really obese women. There are also sites that advocate rape or extreme hate, and that's hard to deal with."

Websense's clients are often less interested in whether their employees are surfing the Victoria's Secret catalog online than they are in maximizing bandwidth and managing productivity, Kester says. They just want to be sure people aren't downloading huge, bulky sound files or playing *Quake* for hours when they're supposed to be working.

—Simone Kaplan

ONLINE LEARNING

Sheep Thrills

By Carol Hildebrand

SISTER CITIES AMAGASE, Japan, and Westport, New Zealand, have come up with a sheepish way to foster communication among schoolchildren. They've set up websites that let the Japanese kids adopt and name lambs from the Westport area. Each lamb gets its own website, courtesy of personal website company Pdom.com (www.lambsonline.co.nz).

New Zealand schoolchildren who attend St. Canices in Westport update the sites with reports about the lambs. The kids from both towns regularly exchange e-mail about the little critters, who have been dubbed with names like Luncheon, Fluffy and Mavis. Anyone can send an e-mail to a lamb and will get an answer courtesy of the New Zealand schoolkids, says Pdom.com CEO Robert Wiles.

Wiles admits the project may sound a little woolly, but it gives the kids an opportunity to learn about different cultures, as well as the intricacies of the Web. "It really is a global village kind of a project," says Wiles. So far, about 10 lambs have been adopted, he says, and several schools in Amagase have gotten involved. The St. Canices school district is even using the program to jump-



start a Japanese language class next year, he adds.

What's in it for the lambs? Sadly, only a little special treatment in the form of a paddock of their own before they become lamb chops.

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Washington Watch

Edited by Elana Varon



EPA Targets Computer Recycling

SURE, YOU WANT to be environmentally responsible and not just throw those old computers into the local landfill, but you're hard-pressed to find alternatives. The U.S. Environmental Protection Agency wants to help by setting voluntary standards for disposing of or recycling old CPUs and monitors.

Mike Shapiro, principal deputy assistant administrator with the EPA Office of Solid Waste and Emergency Response, says more than 90 million computers will become obsolete annually by 2003. In addition, he notes that as of 1998, only 13 percent of old computers were recycled. Many computer components, such as cathode ray tubes in monitors, contain lead and other potentially toxic compounds that make recycling them time-consuming and expensive.

One step toward solving the problem is an EPA-run program to recycle discarded electronics equipment from several federal agencies, including the EPA, Department of Defense and the

Department of Energy. These agencies are working with several electronics manufacturers, which the EPA isn't naming right now, to get them to take back and recycle their old equipment.

Clare Lindsay, a project director in the Office of Solid Waste at the EPA, says that if this project is successful, the EPA will make public its list of manufacturers who agree to take on recycling tasks. That would make recycling easier for CIOs, who could return old equipment to the makers rather than worry about following disposal standards themselves. Once the EPA sets disposal and recycling rules, expect states to ban the dumping of old computers in landfills, says Lindsay.

The EPA is also talking with electronics vendors about designing products that are more easily recycled, reused or upgraded so that they don't have to be thrown away. *—Simone Kaplan*

Would you send old computers back to their makers for recycling if you could? E-mail Staff Writer Simone Kaplan at skaplan@cio.com.

UCITA Redux

CIOs HAVE UNTIL July to weigh in on the latest changes to the Uniform Computer Information Transactions Act (UCITA), a proposed national standard for software contracts. That's when the National Conference of Commissioners on Uniform State Laws (NCCUSL) will vote on 16 amendments designed to give corporate and individual consumers more clout with vendors when they buy software.

If the amendments don't pass muster with the nonpartisan NCCUSL, politics will determine how software

licenses are written, says Carlyle Ring, the chairman of the group's drafting committee. "The void will be filled by Congress, and [campaign contributions] will decide the debate." Ring thinks there's enough pressure from both vendors and consumers to regulate software licenses that one of these groups will take the issue to lawmakers.

Who would win that battle? Barring a consumer uprising, bet on the vendors. According to the Center for Responsive Politics, technology companies donated almost \$40 million to political parties and individual campaigns during the 2000 election cycle, making them the seventh largest group

of contributors.

So far, however, UCITA critics aren't mollified by the amendments drafted by NCCUSL's commercial law experts, which include language to protect consumers from bugs the vendor knows about and a ban against vendors disabling software remotely. Attorneys General from 32 states think UCITA can't be fixed and should be abandoned. "The proposed amendments give the appearance of compromise without the substance of compromise," says David McMahon, a board member of Americans for Fair Electronic Commerce and Transactions, an anti-UCITA lobbying group. *—S.K.*



"Cybersecurity is simply too critical and too endangered to be satisfied with the solutions that are currently available to us."

—Rep. Sherwood Boehlert (R-N.Y.)



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WIRELESS APPLICATIONS

Palms and Flippers

By Susannah Patton

WHEN THREE DOLPHINS at the National Aquarium in Baltimore became pregnant last year, Hans Keller, director of IS, started thinking about how the aquarium would keep track of the vulnerable infant dolphins, which have only a 20 percent survival rate when born in captivity to a first-time mother. He visited another aquarium that had just finished a breeding observation program with beluga whales. "When I saw they had 15 binders full of paper records, I thought there had to be a better way," says Keller.

Keller's IS department decided to use Pendragon Forms Software applications tied to their Microsoft SQL 7 database to capture important behavior data on the mothers right away in order to pinpoint

their due dates. Once Spirit was born in April and Raven and Maya followed in May, staff members and volunteers observed the babies around the clock. They entered data on nursing, heart and breathing rates, and the mothers' responses to their young into Palm Vx devices. During a five-month period, staffers and volunteers logged 2,748 observation hours and entered 170,000 records, all on six Palm devices.

Keller calls the wireless program a success, primarily because all three dolphin babies survived and are thriving, aided in part by the extensive data the aquarium collected. If any small problem arose, marine biologists could check the accumu-

lated data and respond immediately. Also, the wireless program was so cost-effective (total investment for equipment and software came to roughly \$2,100), the IS department is looking at using Palm devices to record and store data related to stranded or stray marine mammals brought to the aquarium for observation. Keller says he's willing to share the aquarium's modified applications with other zoos or aquariums that want to give it a try. "It was a beautiful experience," Keller says. "We'd do it again in a heartbeat."

Aquarium volunteers saved time, money and baby dolphins by logging data on Palm devices.



HOT TOPIC



WIRELESS

Secure Your Wireless Network

By Danielle Dunne

WHAT'S THE EASIEST way to hack into a company's unprotected wireless network? Pick up a few cheap pieces of equipment and sit in the parking lot.

There are many stories of people listening in on corporate networks, but that hasn't made many wireless LAN

users take notice. By the end of last year, Gartner predicted that 30 percent of companies would put themselves at risk of serious security exposures by using wireless networks.

Here are a few ways to make a wireless LAN more secure.

- Enable the security features that come with the wireless network. Yes, the wired equivalent privacy (WEP) standard for the popular 802.11 LANs has been broken into, but a little security is better than no security at all.
- Don't use default or obvious passwords or keys.

- Register the unique media access control (MAC) addresses of the network interface cards that access your network. It is possible to fake a MAC address, but again, something is better than nothing.
- Secure the access points by putting them on switched network ports, as Gartner suggests, or by putting them outside a firewall.
- Monitor the network.
- Monitor physical security. Is there anyone sitting in the parking lot trying to listen in on the network?
- If your applications are Web-based, use secure socket layer encryption. This adds an extra layer of security.
- Use a wireless virtual private network (VPN) or other tunneling protocol.

It may be impossible to eliminate risk, but it can be mitigated, especially when it comes to wireless LANs.



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Off the Shelf

Edited by Carol Zarrow

Look for Trouble

Managing the Unexpected: Assuring High Performance in an Age of Complexity

By Karl E. Weick and Kathleen M. Sutcliffe
Jossey-Bass, 2001, \$25

Chances are, someone, somewhere in your company knows something right now that, if kept secret, could snowball into one really big problem. How effective your company is at getting to—and acting on—that piece of information is

the point of this excellent book. No one likes change, but none of us has a choice. Taking cues from high-reliability organizations (HROs), such as hostage negotiation teams and emergency medical units, the authors (both professors of organizational behavior) have garnered lessons for any company

that wants to avoid not just getting blindsided by the unexpected but getting derailed by it because of top-down and inflexible management systems. Five hallmarks define the HRO, beginning with not resting on success but consistently examining failures. Included in *Managing the Unexpected* are case studies of companies that faltered badly as well as assessment guides to help you change your own company. You may not deal with life-and-death decision making (read the paragraph on working conditions atop an oil-slicked

and seawater-washed nuclear aircraft carrier flight deck) but you'll learn valuable procedures to help get you through the next PR disaster. Or terrorist attack.

—Janice Brand

Global Thinking

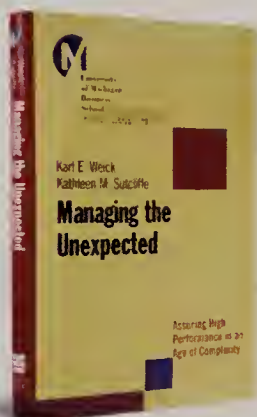
Developing Global Executives: The Lessons of International Experience

By Morgan W. McCall Jr. and George P. Hollenbeck

Harvard Business School Press, 2002, \$29.95
Are effective global leaders born, or are they made? According to *Developing Global Executives*, which bases its findings on extensive interviews with 101 executives at 16 global companies, the answer is—a combination of both.

Aimed at other executives charged with developing global leaders, this book attempts to illustrate how companies can best select and then prepare those candidates for global assignments. Most insightful are the sections of the book where the global executives talk about their own backgrounds, experiences and lessons learned on the job. Unfortunately, the majority of the book

is devoted not to these first-person descriptions but to the authors' findings and methodology. And what they found is not all that surprising. Of the 27 lessons they gleaned from their interviews, only three are unique to global executives. And who vividly conveys this information? The interviewees



CIO Best-Seller List

1. Survival Is Not Enough: Zooming, Evolution, and the Future of Your Company

by Seth Godin
The Free Press, 2002

2. Warrior Politics: Why Leadership Demands a Pagan Ethos

by Robert D. Kaplan
Random House, 2001

3. The Art of Possibility
by Rosamund Stone Zander and Benjamin Zander
Harvard Business School Press, 2000

4. Raving Fans: A Revolutionary Approach to Customer Service
by Kenneth H. Blanchard
William Morrow, 1993

5. Jack: Straight from the Gut
by Jack Welch
Warner Books, 2001

SOURCE: JANUARY 2002 DATA COMPILED BY WORDSWORTH BOOKS, CAMBRIDGE, MASS.

in their all-too-brief firsthand accounts. McCall and Hollenbeck should have taken a lesson from Fiction Writing 101: Show, don't tell. —Megan Santosus

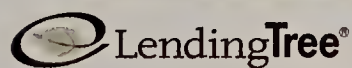
BOOK TALK

What leaders have to do is to get back, get beyond the emotion around [the post-Sept. 11] situation and to look underneath and to see what the business problem is. And the fundamental business problem that we have right now is one that we all know how to deal with. It's a market upset.

—From a CIO Radio (www.cio.com/radio) interview with Winford E. "Dutch" Holland, author of *Red Zone Management: Changing the Rules for Pivotal Times* (Dearborn Trade Publishing, 2001)

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Managing Business on the InternetSM

INTERVIEW

The Commando CEO

DOES THE "C" in CEO stand for commando? It might in this case. Guy Haddleton, CEO of Adaytum, a Minneapolis-based software company he founded 11 years ago, served in the New Zealand Army for eight years in the 1970s and early 1980s—the last four years heading up counterterrorism efforts for the Special Air Service. Although he's always felt like a "born entrepreneur" (he left the military to pursue an MBA), he says his years in the special forces provided valuable lessons for business—and for life.

What lessons from your special forces days have you brought to bear as a software company CEO?

I'm a great believer in the power of small teams and the flexibility they provide. My special forces days taught me about working in small teams, understanding and working through your plan. Another thing about special forces is that they have special people. The same is true in business. You have to recruit outstanding people. They've got to be talented, well trained, committed and self-disciplined. When we're hiring, we look at the strength of character and the talent they have. The power of a team is in the strength of the people.

I also learned to focus on intelligence. You have to understand what your enemies would do so you can walk around them. If you do have to engage, there are three tenets in the special forces: speed, surprise and shock. Say you're taking out a terrorist in a 747. First, you have to move fast. Second, you need to surprise him. If you've caught him unaware, that gives you three or four seconds grace. Then you stun him. When we were preparing to launch our product, our corporate intelligence told us the competition was thinking about launching a similar product. We decided we needed to move our launch date up three months. Some of the employees still have scars from those four weeks of

18-hour days, but we achieved that surprise and stunned everyone.

How do you think the current state of terrorism anxiety has affected the corporate landscape?

It's more important than ever that you have your backup plan sorted out so that in the event you're struck by something, you go straight into recovery mode. You must be prepared for the unexpected.

Also, visible leadership is critical. In uncertain times, a leader has to be in front and talk about what the company is doing. That



Guy Haddleton,
CEO of Adaytum

leader has to have the trust of the employees. They need to know there is a plan in progress, and although this ghastly thing may be happening, you're going to get through it together. —Stephanie Overby

DIGITAL ASSET MANAGEMENT

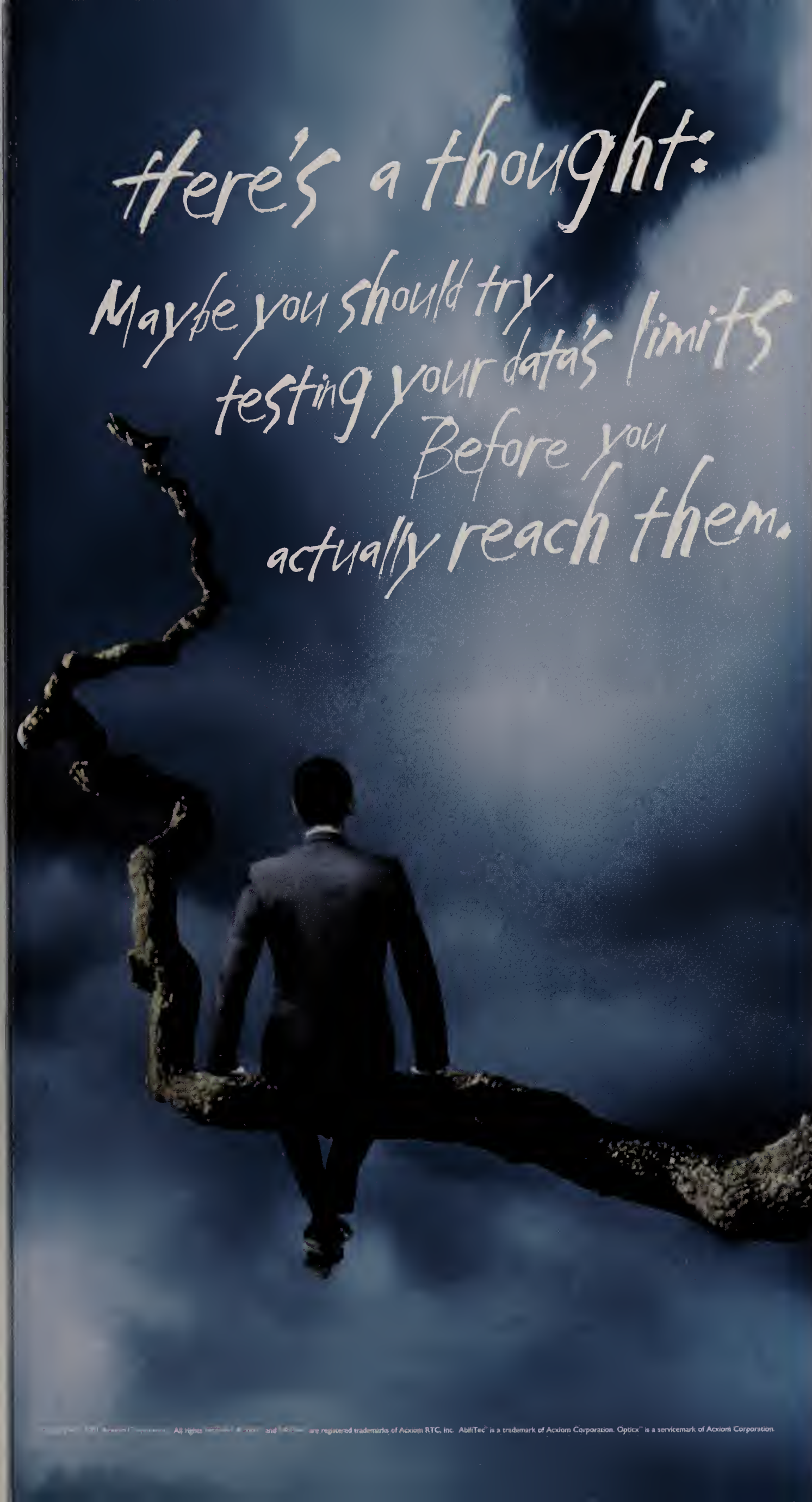
Movie Re-Views

DEEP INSIDE A MOUNTAIN outside Pittsburgh, there's a climate-controlled vault that could be some superhero's secret fortress. It's actually the storage facility for the National Geographic film library, which includes more than 25,000 hours of footage such as Jacques Cousteau's first television show in 1965 and the output of critter-cams, which are cameras mounted on the backs of whales and other creatures. Formats include 16- and 75-millimeter film, Betamax and digital video. Soon, however, everything will be available to download at the click of a mouse.

More than 2,000 hours of footage have already been digitized and loaded into a 5-terabyte database, says Matt White, National Geographic Television & Film's vice president. National Geographic researchers give each shot meta-data tags that catalog the actual content, as well as other attributes. For example, a shot of a tree in the middle of the desert would come up under a search for the tree's species, and under a subjective category like "lonely." The 2,000 hours of video, which contain more than 300,000 individual clips, are available in Real Player and ASF formats so researchers don't have to run to the vaults to physically check film clips to ensure the footage fits their needs. White says local television stations looking for clips of exotic animals, such as the recently discovered giant African crocodile, and researchers who want to count the number of times a critter-cam captured a whale's fin flipping have already downloaded footage. White plans to work his way through the archive, converting 2,000 hours of footage a year for the foreseeable future. The archive, however, recently acquired thousands of hours of footage from the World Bank and intends to acquire more. "It's a never-ending process," he says. —Ben Worthen

Yes. It's a gold mine!

—The response of Scott Stevens, business development director at computer forensics software maker New Technologies, when asked if an investigation of the computer systems at the bankrupt Enron would turn up the contents of shredded documents.



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Davenport on...

Enterprise IT at the Crossroads

Companies need to use technology for long-term business advantage while making short-term cost cuts

BY TOM DAVENPORT

IT'S A DIFFICULT TIME for enterprise IT. Many companies are feeling the weight of cost reduction pressures. No one knows exactly how much chopping and hacking will ultimately be required, so companies go through round after round of relatively small cuts. It's difficult to think about deriving long-term business advantage from technology with these frequent budgetary bee stings. Yet we know that things will eventually turn around, and the steps taken during difficult times to position the organization could really pay off when economic life gets better.

Most organizations need a bifocal strategy with respect to enterprise IT: short-term cost reduction and long-term competitive positioning. Of course, bifocals can initially be disorienting. What makes for cost reduction is minimal functionality, standards, commonality and low expenditure of labor. What makes for competitive advantage is differentiation, a close fit with the business model and human effort to match strategies to systems. However, I see some near-term approaches that aren't compromising long-term goals. I'll also describe some further-out actions that don't require a lot of spending—at least not today.



The Closer View

Cutting short-term costs with enterprise IT is not a new idea, and we can rely on some time-honored techniques: consolidation, outsourcing, process improvement and so on. Consolidation is perhaps the most promising candidate. Most large companies have implemented major enterprise systems with multiple instances or implementations. It's likely that no great competitive damage will be done by consolidating instances across the organization, and consolidating will save on modification, maintenance, support and software licensing costs.

The cry will go up that "our business is different," but the same cries went up in many companies that put in only one or two instances from the beginning, and everything worked out. Some companies didn't even consider the possibility early on that instances could be shared, so consolidation should be easy for them. One European company, for example, put in 400

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different instances of SAP across its diverse businesses. I'm guessing that there might be enough meaningful variation in the company's businesses to justify 10 or 20 different instances.

Even consolidating across single modules can save some bucks. A big U.S. bank, for example, let every major business unit decide on its own what systems it needed for human resources. Fortunately, every unit chose PeopleSoft software, but there are minor variations in implementations. Eliminating those variations and operating off one instance for the entire

What makes for competitive advantage is differentiation, a close fit with the business model and human effort to match strategies to systems.

company could save a passel of money, and it's highly unlikely that the company's competitive advantage derives from its unique HR system implementations.

Process improvement can play a role in short-term cost reduction, but you've got to be looking at it through the right lens. The nearsighted view on process improvement doesn't mean total quality management or Six Sigma or radical reengineering. It simply means reviewing key processes and chopping out non-value-adding activities.

Since most applications don't provide much competitive advantage, it often makes sense to hand them over to people who specialize in implementing and running them. The trend seems to be to outsource not only the application but also the performance of the related process. If you're having someone else run the general ledger system, why not have him take over your basic accounting processes as well?

The only glitch here is integration. If you ask one outsourcer to take over HR management, another to take over accounting processes and another to take over manufacturing, you might wonder how information and processes will flow in an integrated way across these functions. As a result of this valid concern I expect that we'll begin to see outsourcers take on multiple functional pieces and be responsible for their integration.

The Farsighted Perspective

Now look through the top lens of the bifocals, and think of ways to improve long-term competitive positioning with enterprise IT—without spending a lot of dough in the short run. I believe the keys to this perspective involve using company and industry-specific applications, installing new package modules,

continuing to connect the ERP dots, reengineering and taking the interorganizational perspective.

Enterprise IT has become—and perhaps was from the beginning—a commodity. Every business has it, it works roughly the same way, and the only way to extract a drop of competitive advantage from it is to install it for less or tailor it on the margins to fit your company. The only real way to get advantage is to develop your own stuff. For the parts of your business that are truly distinctive and core to your success, it makes sense to build your own

and interface it with the rest of your enterprise systems. Intel did it with manufacturing and product design systems; Compaq with production forecasting and product configuration. Every business ought to be thinking about some killer app that it doesn't want to share with the rest of the world.

If you think you can't afford your own stuff, you can at least partner with a vendor or other companies in your industry to customize systems to your specific processes. That's what Reebok International did with SAP to make the system

work for selling apparel at retail. A group of oil companies worked together to create IS-Oil, a tailored version of SAP that now goes by the name MySAP Oil & Gas. There's a version of PeopleSoft customized to work for state governments. And so on. The upside is that sharing the work with a vendor means you don't have to pay for it all. The downside, of course, is that others get to use the system, but you can at least be first.

Contrary to how it was viewed in the early 1990s, business process reengineering (at least when done correctly) is a long-term solution, not a short-term palliative. But it's still a good idea when radical IT-enabled change is necessary. Look beyond the old standby processes of order management and procurement, and focus on those that help to achieve more desirable products and services in the marketplace, such as marketing and product development.

Finally, there's a lot of interest in transforming interorganizational relationships with enterprise IT. In case you were waiting for my endorsement of this activity, you have it—but with a strong caution. It's a truly long-term initiative to develop seamless transactions with your customers and suppliers—maybe a decade or so if you haven't started already. And try not to partner with the rest of your industry as you do this, or your distinctive products and services will end up as just another line on a crowded computer screen. That's one purpose for which we don't want bifocals to be employed. **CIO**

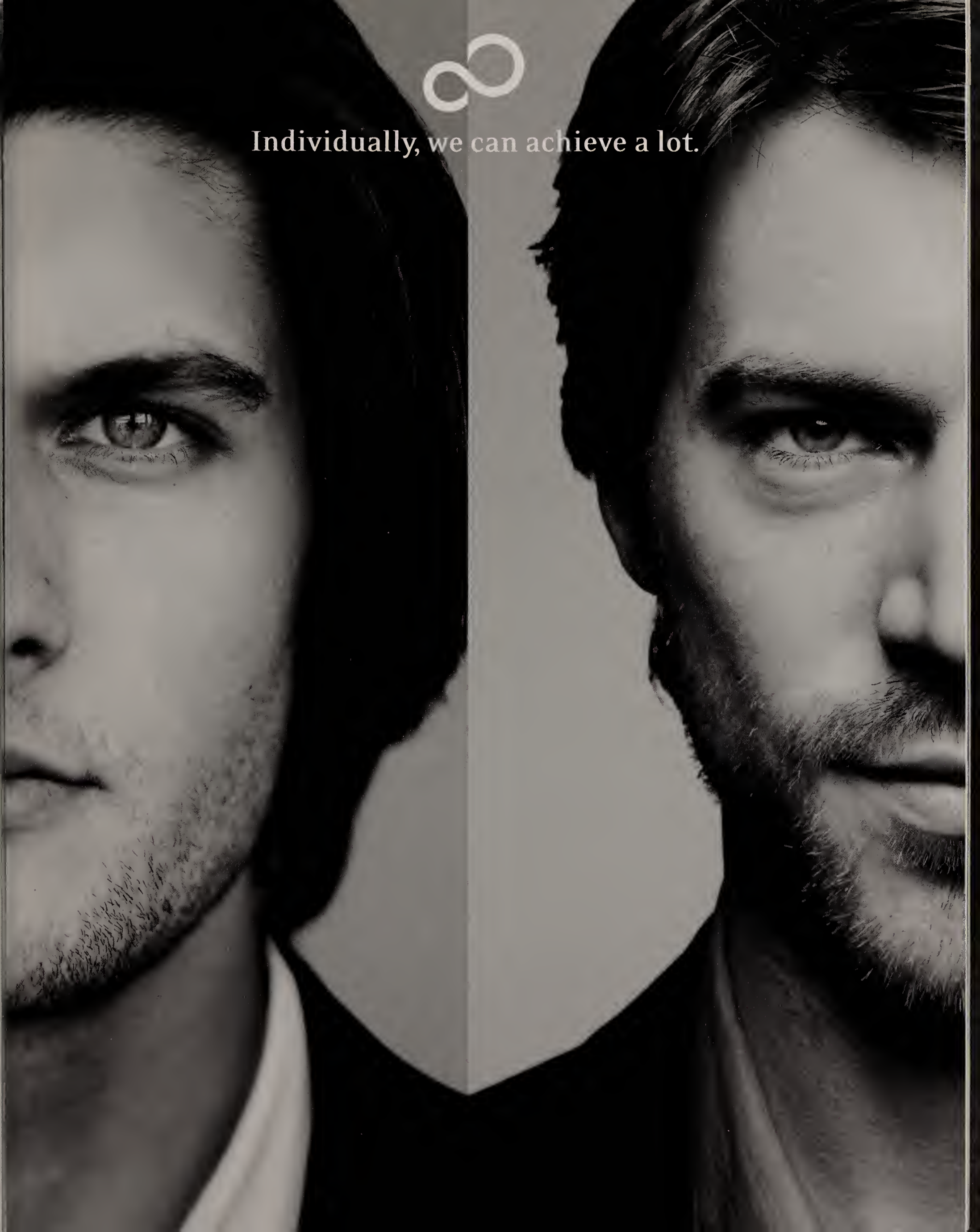
Tom Davenport is the director of the Accenture Institute for Strategic Change and a distinguished scholar at Babson College. You can reach him at davenport@darwinmag.com.



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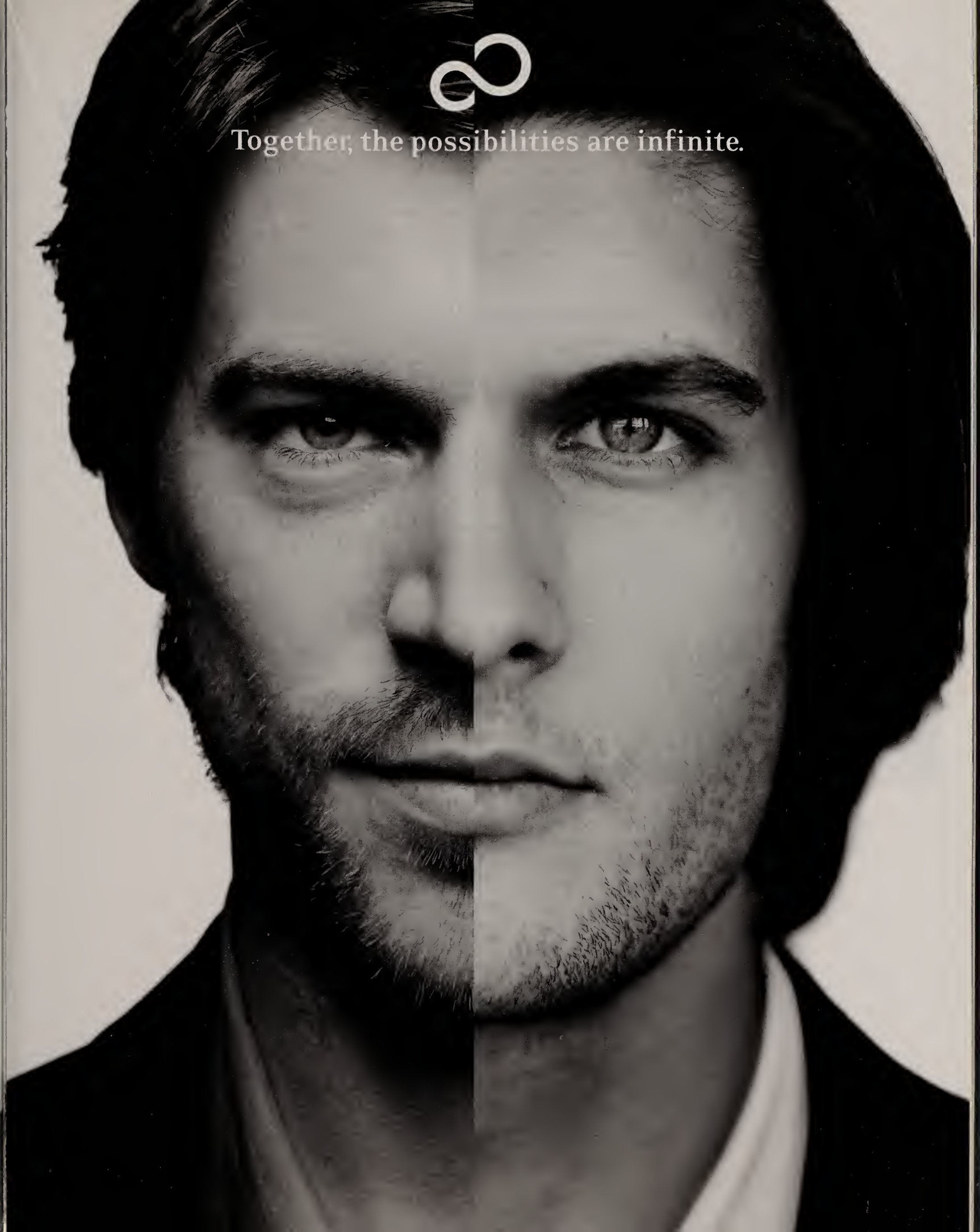
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World View

Doing Business Globally

When Face-to-Face Doesn't Fly

With travel budgets slashed, conferencing technologies can help global companies fill the communication void, but only up to a point

BY DAVID DOBRIN

I ONCE MET A WOMAN on a plane heading to Chicago who had logged 275,000 miles so far that year—and it was August. She bought companies for General Electric, and a lot of those companies were in South Africa, Thailand and Brazil. To do her job, she was averaging more than 1,000 miles a day in the air. In Mexico City, she picked up the Airphone and started making calls. Only on the approach to Chicago did she put it down.

I'm not terribly sympathetic to these road warrior heroics. Did she really have to be there in person for all those meetings? The phone is a wonderful invention—something she apparently already had figured out; if she needed to review documents, there's Web conferencing or videoconferencing.

Before Sept. 11, there was little debate: If a meeting was really important, you had to be there. Post Sept. 11, the travel picture has changed. Yet companies still need to hold global meetings. Now that there is a strong sentiment not to fly, businesses must figure out how else to facilitate important meetings among people in other countries and on other continents.

To hold important meetings among a disparate audience, there are three technologies available: teleconferencing, Web



conferencing (using the Internet to share files while talking on the phone) and videoconferencing (which can be combined in various ways with the other two).

None of the technologies is as good as being there in person, especially when the meeting crosses cultures, borders, languages and time zones (in other words, when a meeting is global). Yet when travel isn't an option, one technology works better than another for specific kinds of meetings. Therefore, treat each technology as having a different kind of business use or purpose. If the CIO can't get the team together in person, he should run the meeting in a way that recognizes the limitations of conferencing technology.

A lot of CIOs think that their job ends when they buy the right conferencing technology. Think again. CIOs have a responsibility to see that any technology is used effectively. Besides, CIOs are investing IT money (no, it's not coming out

of the decimated travel budget), so they want to make sure their investments are put to good, effective use.

Therefore it's necessary to recognize where remote conferences—when conducted correctly—are genuinely more effective than the in-person alternatives.

Look at Web conferences. As an analyst, I listen to a lot of earnings reports. Three years ago, CEOs did these meetings in person with key analysts or else did them much less effectively as teleconferences. Now, Web conferencing technology has taken over.

With Web conferencing, a company can bring in many more analysts, and indeed, it is now routine to time earnings reports so that they can include the European community. For their

Videoconferencing leaves a lot to be desired, particularly when an international crowd is involved.

part, the analysts can ask questions and listen to answers. From the company's perspective, no one has to waste time and money putting on an event.

Web conferencing is optimal when a meeting is basically a form of broadcast, where one person does most of the talking but there may be a few questions from the listeners. The technology is also effective when the speaker works from a document such as an earnings report or a PowerPoint presentation.

For global meetings, Web conferencing surpasses teleconferencing for broadcasting purposes because differences in language or time zones are exacerbated with teleconferences. With a shared document, the meeting can be more inclusive for a longer period of time. Conversely, if teleconferencing is used for broadcasting, the meeting should be shortened accordingly.

There are times when a meeting demands real interaction, and videoconferencing seems like a viable solution. But be forewarned that the technology leaves a lot to be desired, particularly when an international crowd is involved.

A year or so ago, I was on a global project for a large American electronics company where the Irish contingent felt (quite justly) that their needs were not being respected by the team as a whole. The company's solution was to hold meetings using videoconferencing.

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Can remote conferencing technologies replace the face-to-face meeting? Go to **CIO READER POLL** at www.cio.com/readerpoll.

It was a nightmare. First of all, a lot of these videoconferences started at 1 p.m. (6 p.m. Irish time) and went on in the way of undisciplined meetings everywhere. When I was on (and I was on a lot), I tried to include our Irish colleagues, but I often failed—forgetting to look in the camera when things got interesting and neglecting to respond if the people in Ireland raised their hands.

By using videoconferencing purely as a substitute for an in-person meeting, we forced everyone to put in the same amount of time—and even more attention—that they put into a regular meeting. Yet we got only the illusion of personal contact.

Videoconferencing works better when only a few people are involved and when the meetings don't have much formal structure. In essence, videoconferencing is fine when used by two people with Web cameras having a short conference but falls short when used by 20 people from three countries in an all-day marathon.

To facilitate communication on a global scale, there are three rules of thumb for using these technologies in a more nuanced way. First, the more broadcasting there is in a meeting, the more appropriate teleconferencing or Web conferencing is. But don't expect the broadcast to be as effective as in-person broadcasts. Second, conferencing technologies put more strain on participants, so make videoconferences or Web conferences shorter than the corresponding meetings would be, and involve fewer people. Third, don't expect any technology to substitute for travel. The remote participants at a Web conference just won't take away what they would if they were meeting in person.

While wholesale travel is now no longer possible, remote conferencing can be enhanced when more reliance is placed on asynchronous technologies. A friend of mine tried to use Web conferences for sales pipeline meetings, rather than flying all over the world. They didn't work too well; the Web conferences were not nearly as effective as the face-to-face meetings, where he would glare at a salesperson who claimed a customer was in the bag and the salesperson would quail and retreat.

But the Web conferences got more effective when he required salespeople to file frequent progress reports and then used Web conferencing to hold impromptu meetings when the report seemed to call for his help. He couldn't glare during these meetings, but he often didn't need to.

While remote conferencing technology can satisfy some global communication needs, accept the fact that you may have to meet in person. **CIO**

Questions or comments? Let Senior Editor Megan Santosus know at santosus@cio.com. David Dobrin is president of B2B Analysts, a software consultancy based in Cambridge, Mass.



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How to Succeed in Strategic Planning

CIOs have two important roles. They're not easily performed.
BY MARK GORDON

A decade ago, most CIOs had to beg or negotiate their way into the organization's strategic planning process. Things are different now. Few CIOs today find it necessary to plead for a place at the table, says Michael Earl, director of the London Business School's Centre for the Network Economy. His research indicates that more than half of CIOs are being invited to take a seat. "The expectations have changed. In most sophisticated corporations, it is simply assumed that CIOs will be involved in strategic planning," he says.

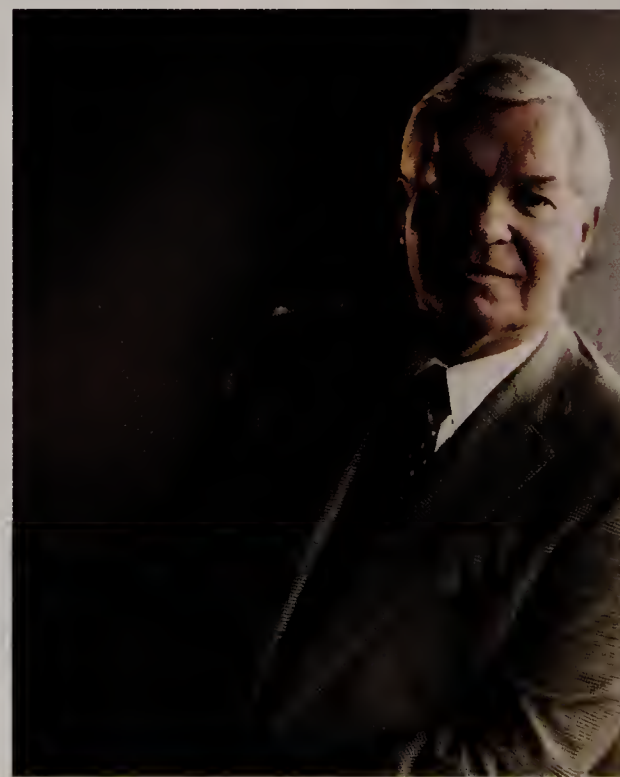
Near-constant reassessment might be the defining characteristic of contemporary strategic planning. "The cycle these days is very, very short," notes Earl. "In many corporations, the strategic plan is reviewed monthly, even weekly." Frequent—some might say frantic—reassessment is also the coin of the realm in IT, and CIOs are therefore accustomed to making quick judgments about new technologies. As a result, CIOs are uniquely suited among their colleagues to take a leading position in the ongoing development of the strategic plan.

Once CIOs are seated in the boardroom, however, precisely what role do they play in strategic planning? For answers, look to technological change—which is, after all, why CIOs were invited to the strategic planning process in the first place. "The Internet has changed forever the notion of business and IT stratification," says Ryan Nelson, director of the Center for the Management of Information Technology at the University of Virginia's McIntire School of Commerce. "Along with applications like ERP

and CRM, e-commerce has brought IT front and center to the executive table."

The Technology Scout

One challenge CIOs face is synchronizing the company's vision with the pace of technological change. Once, organizations could fashion mid- and long-range plans, confident in the relative sta-



CIOs have to keep up with technology developments, but more importantly they must determine when their company can adopt new technologies and systems to the best effect, says Marriott International CIO Carl Wilson.

bility of their underlying assumptions. Today, that same five-, three- or even one-year window may represent an entire generation in business-critical technologies. Which begs a question: Is it even possible to plan strategically—that is, with a view to the long term—in such an environment?

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Hot Seat

"Yes, it is possible to [develop a] vision and plan out three years in advance," declares Carl Wilson, executive vice president and CIO of Marriott International in Washington, D.C. "Although when technology was more static, one did have a clearer view of a few years out." The trick is gauging how soon new technologies will be assimilated by society at large, he says. This is where the CIO's role as technology scout is most valuable to his partners in the executive suite.

"For instance, over the last two years we've seen a lot of push by the vendors of wireless technology," says Wilson, who has been a part of Marriott's strategy process for five years. "Now there is no doubt that wireless is going to be a major factor in delivery capability to individuals and within companies. The question for us is whether we make a major investment in the bleeding edge of wireless when we know that only 1 percent of the population is currently using it at that level. Or do we say, 'Let's stay open here, move carefully, wait until the consumer starts to pull, and then adopt quickly.'"

The 16th-century Japanese military strategist Miyamoto Musashi once wrote, "Perception is strong and sight weak. In strategy it is important to see distant things as if they were close and to take a distanced view of close things." This is the role of a scout, to go beyond the immediate problem, seeing its true implications and identifying other, perhaps more important challenges on the horizon.

"Smart CIOs know not to jump on any bandwagons," says the University of Virginia's Nelson. "On the other hand, they also know when to pioneer in the application of proven technologies. That's a vital skill"—albeit a difficult one.

Sometimes a CIO's technology reconnaissance can lead to new external business lines and service offerings. That was

the experience Preston B. Bradford had with EAI. "Not long ago we decided to deploy EAI in-house as a means of improving our own organization," says Bradford, senior vice president and, until recently, CIO for Sapient, a Cambridge, Mass.-based technology consultancy.

effective," says Richard Ricks, CIO of Brampton, Ontario-based Nortel Networks. "There is tremendous value when a CIO understands—and articulates—how decisions impact the technology direction as well as the business process in a holistic way."

CIO ROLES IN STRATEGIC PLANNING

SCOUTING OUT NEW TECHNOLOGY

- Gauge how soon new technologies will become widely used
- Decide when your company should be an early adopter and when you should wait
- Keep an eye out for business opportunities bred by new technologies

INTERPRETING NEW TECHNOLOGY FOR CXOS

- Explain the benefits and pitfalls
- Calculate the financial ramifications
- Articulate the effect of new technologies and systems on business operations

"Very soon, however, we discovered that we were able to leverage our newfound expertise into solutions for some of our clients. Now we're considering developing a practice in that area."

The Technology Interpreter

Being an authoritative technology interpreter is a requirement for CIOs who want to be effective in strategic planning. For Wilson, this means being fully conversant in two, often distinct vocabularies. "The common language of business is still accounting and finance," he says. "You need someone who understands technology and can interpret it in business terms for others."

But interpreting technology for your business colleagues means more than explaining what acronyms like ERP and ASP stand for. CIOs must be able to bridge the gap between IT and operations. "I had better understand how information technology is evolving and how it enables our operations to be more

London Business School's Earl agrees: "The CIO has to be a good technologist, but first he has to show that he understands the business. That's the entry ticket. Then the CIO's role is to understand new technologies and interpret how they might be applied to the advantage of the business."

The process discipline that is so vital to IT work can add another dimension to the CIO's role in strategic planning. "One of the most difficult and important things I do is shine a light on process," says Charles Wodehouse, president of Jacksonville, Fla.-based CSX Technology, the IT service unit of transportation giant CSX Corp., headquartered in Richmond, Va. "I have to keep pushing on the company's process view of itself. My strength is looking at how we can apply technology to make our company easier to do business with, more efficient internally, a better utilizer of capital assets."

Wodehouse, who worked his way up through the CSX financial ranks before

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becoming CIO, notes that IT and finance share a deep cultural commitment to process, making them complementary teammates in strategic planning. While CFOs could take tips from CIOs on the importance of technological innovation, he says, CIOs also have a lot to learn from their colleagues on the money side of the house: "IT has to be driven by a basic understanding of business and fundamental appreciation of economics."

Perks of Planning

Effective CIO involvement in the strategic planning process is not only good for the company, it also yields great benefits for IT departments and executives themselves. "For me to have the broad context, to know where the company is going, makes IT deployment so much easier," says Wodehouse. "It helps with funding, with prioritizing projects, even in designing systems themselves."

Ricks sounds a similar note: "I gain a clear understanding of where the business is going, the impact to business processes and infrastructure, what services may be leveraged more extensively, and what activities are needed."

Marriott's Wilson views his role in strategic planning as insurance against poor decision making. "For instance, if I hadn't been involved in strategic planning for CRM, I might have been inclined to go out and implement something without knowing how our heads of marketing, finance and operations were looking at it. And I might have messed it up," he says.

Of course, the most basic business knowledge is the desire of the customer. As marketing guru Al Ries puts it, "Strategy should evolve out of the mud of the marketplace, not in the antiseptic environment of an ivory tower." It is no less important for the CIO to be an interpreter of consumer desire than it is for a

MANAGEMENT BRIEFS MULTITASKING

Tallying the Cost of Doing Too Much

You know what happens when you have too many windows open on your desktop—at best your computer's response time is reduced to a crawl, at worst...crash! Your brain may react the same way to multitasking, according to "Executive Control of Cognitive Processes in Task Switching," an August 2001 study. In clinical experiments, study groups were asked to complete a combination of tasks. Subjects who alternated between activities took substantially longer than those who tackled one job at a time, says David Meyer, a University of

Michigan professor of psychology who is one of the study's authors. Meyer estimates "switching-time costs" to be as high as 25 percent to 50 percent more per individual task, depending on its complexity and familiarity.

But with practice there is hope for improvement, Meyer says. "In order to be optimized for multitasking, you have to be able to willfully control your attention"—something that is emphasized in many meditative practices. Still, he warns, "no matter how hard you try, you will never be as good multitasking as you are concentrating on one [task]."

—Amanda S. Fox

Turning Multitasking into a Tool

By its very nature, IT work requires multitasking. But what some see as a necessary evil, others see as an advantage. Rick Bauer, CIO of The Hill School, a prep school in Pottstown, Pa., uses multitasking as a cross-training tool. He actively encourages his team to balance core job responsibilities with other pursuits. A

network administrator may double as a lecturer in a computer training course or take time to get down and dirty with new security innovations. On a larger scale, IT multitasking should be defined by a strategic planning process.

Diane Barbour, CIO of the Rochester Institute of Technology in Rochester, N.Y., incorporates her employees' multitasking into her strategic plan. "We are working on a process here where all

new projects and unanticipated work flows through a program management office [PMO]," she says. The PMO tracks the workload of every staffer to determine who has the bandwidth to take on new tasks. Barbour also sets

well-defined goals for employees. "I make it clear to them when they are hired that they will be spending X percent [of time] on project A and Y percent on project B."

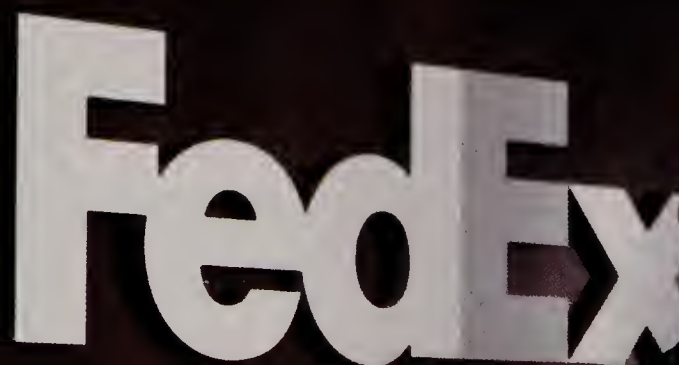
Not all CIOs support this approach. Dale Tennison, CIO of GLT & Associates, a data mining company based in Hudson, Wis., defines IT multitasking as "a natural reaction to management's inability to provide focus and direction." Tennison's correctives are project management discipline and ROI project analysis. The bottom line in multitasking, Bauer says, is that "saying no is as important as saying yes." —A.F.



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marketing executive or product development manager. Catching up on the customer perspective is the first thing Sapient's

Bradford always does when starting the strategic planning process. "You can miss the mark if you're not close to your customers," he says. "I spend about 20 percent of my time out talking to clients, working with account teams, understanding what the problems are, and I find that to be extremely valuable in strategic planning."

In the end, strategic planning is about success in the marketplace. Since IT is an essential component in the recipe for success in most organizations today, it's

"If I hadn't been involved in strategic planning for CRM, I might have been inclined to go out and implement something without knowing how our heads of marketing, finance and operations were looking at it. And I might have messed it up."

—Carl Wilson, CIO, Marriott International

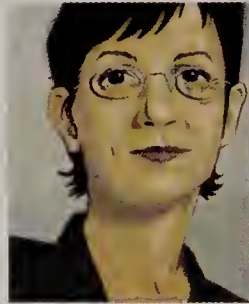
imperative that CIOs perform their role well. Nortel Networks' Ricks, with 23 years of IT experience, including 12 years of strategic planning practice, offers this advice to fellow CIOs: "Don't be a wallflower. The nature of a CIO is to see the total business process end-to-end.... CIOs can bring tremendous value to the strategic planning table—so insist upon it." **CIO**

What's your role in strategic planning? Send e-mail to hotseat@cio.com. Mark Gordon is a freelance writer in Westerly, R.I. He can be reached at markgordon@att.net.

LEADERSHIP IMPERATIVE

BY SUSAN CRAMM

The New CIO Mantra: Shut Up and Listen



FOR THE NEXT THREE MONTHS, keep your mouth shut and don't do anything.

This advice was given to me on the first day I worked as a CIO. It sounds simplistic, but it's great advice for new CIOs or experienced CIOs who have just joined a company. The underlying premise is sound: You can do more harm than good during your first 100 days on the job by making

decisions without the necessary facts and relationships.

The rookie executive who walks in to a new job spouting off opinions about what's wrong has the political equivalent of spinach in his teeth. By the time somebody tells him to shut up, listen and learn, he is facing a major deficit in the credibility bank.

This profile is pretty black and white—none of us would commit this type of faux pas, would we? Well, in real life there are a lot more shades of gray. Here are some true examples of smart people who did some stupid things.

▪ To meet an HR deadline, the CIO of a financial services company hustled to give performance reviews to the employees he had inherited. He worked hard to collect 360-degree feedback, but he was unable to achieve the ultimate goals of the reviews—namely, agreement on future performance expectations and development plans—because he could not analyze and convey the information in a way that was credible to his staff.

▪ A CIO new to another financial services company fell into the trap of determining the rollout strategy for software with a spotty track record even though she lacked the appropriate information. As a result, she is being held responsible for implementation problems that were not created by her but that she had allowed to continue.

▪ A retail industry CIO pushed the "reorg" button too early. He felt the need to make hard decisions when head counts were doled out to avoid losing out in the budgeting process. A

subsequent reorganization was necessary, which he had to sell to a much more skeptical audience.

▪ A CIO of a transportation company listened well to his clients but forgot to spend time to get to know his staff. When he started to roll out his leadership agenda, he was stopped dead in his tracks by an organization that wasn't on board.

All these miscues have a common ingredient: CIOs who stopped listening too soon because they felt forced to take some action. Forced because they wanted to fix what seemed (to them) so obviously wrong, to make a quick impact, to meet a schedule or to avoid disappointing an important client.

Look Before You Leap

Those CIOs forgot the truism that ideas are cheap—the hard part is delivering results. Don't make commitments that your organization cannot keep. Just because something is screwed up doesn't mean you can fix it or fix it quickly. One of my favorite



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aligned with company goals.
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expressions is "Most organizations have the IT capability they deserve." Understand that the state of IT in your company is the way it is for good reason. If something is obviously wrong, try to figure out why the organization has ignored fixing it and what you can realistically do to counter that.

A lot of decisions can be deferred or made in stages. For example, the new CIO of Dell Computer knew that SAP would not work for his organization, but he had no idea what would work. He asked for and got three months to formulate a new recommendation and plan. Don't be forced into making decisions for which

Ideas are cheap—the hard part is delivering results. Don't make commitments that your organization cannot keep. Just because something is screwed up doesn't mean you can fix it or fix it quickly.

you don't have the necessary information or insight. If a project is headed for disaster but you don't know what to recommend in its place, share the information that you have and ask for time to develop a new action plan. If performance reviews are due, ask for an extension. If next year's budgets need to be finalized, ask for a reasonable dollar amount and plan for a review in six months.

Once you've gained the time necessary to listen, what is it that you need to learn during your first 100 days? You should be gathering information and building the relationships necessary to establish your IT leadership agenda. That includes an assessment of IT effective-

ness, your vision for IT, key strategies and priorities for the next six to 12 months, a definition of IT performance metrics, and current baseline measurements. To develop your leadership agenda, you need to gather the right information. Start by asking the following questions.

▪ *What's the state of the business?* Where is the company's money made and spent? What is the business vision and strategy? How is performance measured, and who is accountable? What is the industry value chain and your company's relative competitiveness?

▪ *How credible is IT?* What value has IT delivered in the past? How are IT decisions made? What is the value of the current project portfolio? What are IT's greatest successes and failures? What is the likelihood of delivering current project commitments? Can IT deliver high-quality operational services at reasonable costs? Who are the stars of the organization and are they in positions of influence?

▪ *What is your IT architecture?* How well is the company's value chain supported by IT? What capabilities exist relative to the industry? How appropriate is the underlying technology? Are standards defined and adhered to?

Run with the Right Crowd

Those are the right questions to ask in your first 100 days; to get the right answers, you need to hang out with the right people. They include your peers, your staff, consultants and vendors, and the front line. Getting to know other executives might seem obvious, yet it surprises me how many new CIOs don't understand that peer relationships are critical to their success. Getting to know your staff is also crucial. Equally important is that they get to know you. During the first 100 days, your staff interactions should be focused on both gathering data, and building trust and faith in your leadership. Consultants and vendors can

sometimes be a very good resource to help you assess your systems and organization against industry and IT best practices.

Last but far from least, you need to get to know the front line. The front line is the employees in your organization who interact with the consumer. The front line is where IT value resides. Understand how to improve the interactions with your consumers so that you can identify the foundation of your IT strategy.

A lot of my clients ask me if they'll have a honeymoon period when starting a new position. I always tell them no. They must focus immediately on building relationships, understanding the business and delivering a few quick wins. CIOs who can do those things will get credit for a great start. In most cases, three months is a reasonable ramp-up period, and six months is way too long.

At the end of your first 100 days, you should be able to articulate your agenda, and you should have the right people lined up to help you make it happen. You can accomplish those tasks only by closing your mouth and opening your ears. If your tendency—like most people—is to walk around with spinach in your teeth, remind yourself of the Shut Up and Listen mantra by placing some toothpicks on your desk. **CIO**

Susan H. Cramm, former CIO and vice president of IT at Taco Bell and CFO and executive vice president at Chevys, a Taco Bell subsidiary, is president of Valuedance, an executive coaching firm based in San Clemente, Calif. She can be reached at shcramm@aol.com.

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NOW IS THE TIME TO **PULL THE PLUG** ON YOUR **LEGACY APPS**

Kevin Murray, CIO of American International Group, showed his board that they could save 30 percent of the cost of legacy maintenance if they moved from main-frame to thin client. "Their jaws hit the floor," he says.

Right now, the economy is reeling. Right now, everything seems uncertain. Right now, the CFO is glowering, the CEO is cowering, and the shareholders are rebelling. Despite all that, right now is the perfect time to tear down your legacy applications and start over. BY SIMONE KAPLAN

KEVIN MURRAY, CIO OF DOMESTIC BROKERAGE AND PERSONAL LINES FOR AMERICAN INTERNATIONAL GROUP (AIG),

had a mainframe full of fat-client legacy applications. He just trashed it in favor of newly written thin-client Java and XML applications.

Dan Roberts, CIO of the PMI Group, a mortgage insurance company, is in the middle of Web-enabling his back-office legacy systems, a project he anticipates will take up to three years. However, he says it's "absolutely necessary" if his company is going to keep up with product development and customer demands.

Maria Fitzpatrick, CIO of PacifiCare Health Systems, just decided to get away from the multiple OpenVMS and Unix programs scattered across her company's business units, and upgrade to a single Web-enabled platform. The project is part of a major effort to redesign PacifiCare's corporate strategy by unifying business processes across all units.

The list, long now, will get longer. Every day thousands of enterprises rely on decades-old applications written in obsolete programming languages that, along with the systems on which they reside, are no longer supported by the application's creators—whoever they were and wherever they may be.

So why don't CIOs just pull the plug on these ancient applications?

"If it was that easy to get off these systems, most CIOs would have done it already," says Dale Vecchio, research director of application development for Stamford, Conn.-based Gartner.

"The only way I'll address renovating my

legacy systems is if they stop enabling the business," says John White, vice president of IT at Parker Hannifin, a Cleveland-based manufacturer. "My barometer is the ROI," he says.

While White's rule of thumb is widely held, more and more business executives are coming to grips with the fact that the Internet has placed demands on companies and computing systems—such as real-time order processing and managing high-bandwidth demands—that most legacy applications just can't handle. CIOs know this better than anyone else. But right now would be the worst time for an organization to begin a major infrastructure face-lift, wouldn't it? The economy is in clampdown mode. Enterprises are struggling to find cash for the most basic projects. Only the nuttiest CIO would argue for spending money on infrastructure, and only the most irresponsible CEO would approve the expenditure. Right?

Actually, not right. In fact, spending money to keep legacy applications going is a mistake. Assigning personnel to keep legacy applications running is a big mistake. Making business plans based on legacy applications is an enormous mistake.

Despite all apparent evidence to the contrary, right now is the *ideal* time to either pull the plug (which would be ideal) or overhaul legacy applications. And a whole roster of major American enterprises are seizing this opportunity to get a jump on their competitors by modernizing (connecting their legacy system to a Web front end) or migrating their

Reader ROI

- ▶ See why your peers decided that now is the right time to rebuild their legacy infrastructures
- ▶ Discover what arguments to take to your board for undertaking legacy modernization and migration projects
- ▶ Learn about new tools for making pulling the plug on your legacy applications easier and cheaper

legacy systems to new thin-client-based Web systems.

And they're doing it right now.

THE LEGACY ALBATROSS

Legacy applications underlie almost every enterprise. In general, these applications are stable but inflexible, expensive and difficult to maintain. How expensive? According to Gartner, between 60 percent and 80 percent of an average company's IT budget is spent on maintaining existing mainframe systems and the applications that run on them. Maintenance of legacy software is complicated by the fact that the number of programmers who know how to handle former standards such as Cobol is shrinking with each passing year.

Though not every legacy application needs a complete overhaul, the harsh reality is that *all* legacy systems at least must be Web-enabled if a business is to grow and remain competitive, says PacifiCare's Fitzpatrick, senior vice president and CIO of the \$12 billion Santa Ana, Calif.-based company. Fitzpatrick plans to migrate from three disparate legacy software systems to a single, Web-enabled platform, which she hasn't yet chosen.

"Right now, cost efficiency is key," she says. "Maintaining and trying to integrate multiple software platforms becomes expen-

closer contact with its constituents—doctors, hospitals and employers—and decrease administrative costs.

"The most important justification for beginning this kind of project is the business need," says Bruce Fadem, vice president and CIO of American Home Products, a \$13.3 billion global pharmaceutical company based in Madison, N.J.

Because legacy applications are so tightly tied to the way a company functions, the

quences such as errors, delays in processing and fulfillment lags. These are things that will drive your company out of business."

YOU ARE YOUR LEGACY SYSTEM

Before beginning any kind of modernization or migration project, business and IT executives must understand exactly what their legacy systems do and whether the way the systems work actually reflects the business strategy, McDaniel says.

"It's a huge mistake to jump into migration on a per-project basis just to see where it leads," he says. "Develop a vision of where you want your architecture and infrastructure to be in two, four, six and eight years. Assess what skills are available and know what your investments are right now in development versus maintaining legacy applications. Does the existing system map the key business processes that are critical to success? That's where you must start."

David R. Guzman, senior vice president and CIO of Glenallen, Va.-based maker of medical and surgical supplies Owens & Minor, did just that. His legacy systems were configured to assume that Owens & Minor, with \$3.5 billion in revenues, owned all the supplies it shipped to customers, but the company was evolving toward a third-

Modern Math

How PMI figured the ROI of legacy migration

Here are some numbers from the PMI Group's 1996 cost-benefit study that started it on its path to legacy migration

Benefits	
Avoiding service-related revenue reduction	\$27.8 million
Winning back lost business allocations	\$9.1 million
Gain in market share	\$20.4 million
TOTAL GROSS BENEFITS	\$57.3 million
Expenses	
Duplicate processing expenses	\$14 million
Estimated cost of project	\$20 million
TOTAL COST	\$34 million
NET BENEFIT TO COMPANY	\$23.3 million

SOURCE: PMI GROUP CIO DAN ROBERTS

Between 60 percent and 80 percent of an average company's IT budget is spent on maintaining existing mainframe systems and the applications that run on them.

sive over time. There's a great business need for companies to strive to provide increased service levels to customers. Web capabilities are the path."

The project's expected ROI stems in part from the projected decrease in maintenance costs of the new system compared with the legacy system, she says. Also, by linking to the Web, Fitzpatrick can put her company in

health and flexibility of those applications directly affect the business' ability to grow.

"The time is right for modernization because the attempt to marry the worlds of legacy and e-business has reached the point of pain," says Tyler McDaniel, an analyst with the Hurwitz Group, an IT consultancy in Framingham, Mass. "If you wait to modernize, you'll continue to suffer conse-

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party logistics distribution model. What Guzman needed was a system that allowed the company flexibility in distribution methods. This provided the business rationale for migrating to a Web-based platform.

For Roberts, CIO of the \$763 million San Francisco-based PMI Group, his legacy system's ability to support customer demands

was "questionable." The back-office systems, which included claims payment, billing and policy maintenance, were 12 to 15 years old. According to a 1996 study commissioned by PMI (one year before Roberts arrived), the cost of modernizing the company's legacy systems, estimated to be about \$20 million (see "Modern Math," Page 58),

was less than the estimated cost of the potential service-related failures that could result if the systems were left in place.

At that time, PMI staff in both the IT department and the policy servicing department were spending hours cross-referencing customer data between the legacy systems and the separate policy systems. As the two systems didn't talk to each other, there was always the risk that someone might miss something during the manual check.

"It was only a matter of time," Roberts says. "Everyone knew this was a long-term problem and that our business was getting more, not less, complex."

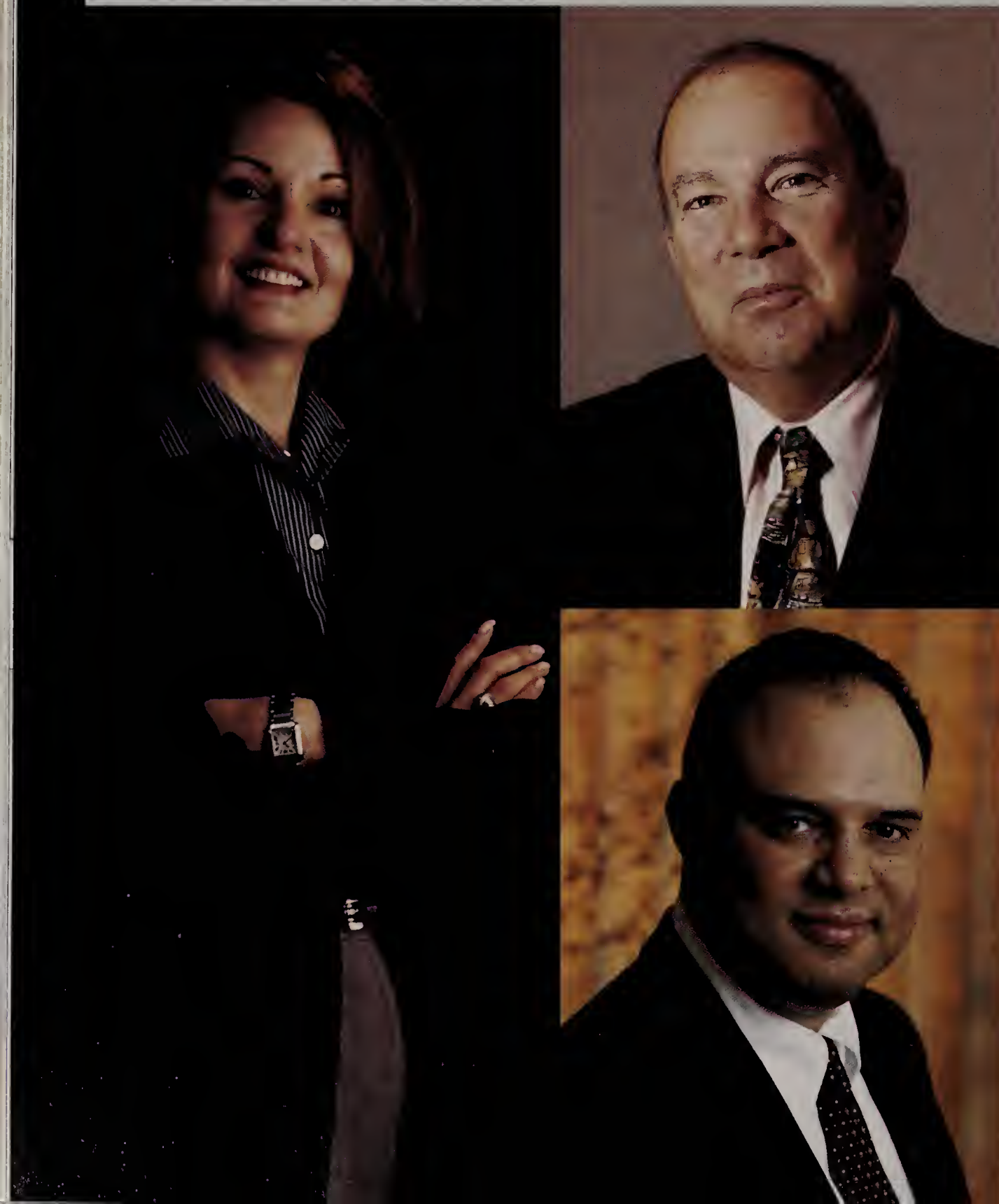
After careful analysis, Roberts determined that the database underlying his systems wasn't inherently flawed. He stuck with the AS/400 platform and is rebuilding his back-office applications in Java and RPG, an AS/400-specific programming language. He's looking at several legacy migration tools that could handle translating the data analytics processes hidden within his legacy transaction processing system, but he has not decided yet on a particular tool. (See "Your Modernization & Migration Toolkit," Page 62.)

PMI's executive board members knew the legacy system was a problem, but they delayed the migration project in order to focus on getting the company's e-commerce strategy in place. Once that was complete in late 1999, Roberts and Kathy Schroeder, vice president of policy management systems and the project's business sponsor, got to work convincing the board that the time was right to tackle the migration. And one of the reasons the time was right, they said, was that the cost of the project, estimated at \$20 million in 1996, had come down in 1999 to an estimated \$12 million.

"The board knew that the business had changed and that the legacy system wasn't built to deal with the kind of claims processing and transaction products we had," Roberts says. "They knew that if we created a new product, the old system would limit our ability to roll it out. We had to make it very clear that waiting any longer could really hold us back."

THREE WHO SAW THE LIGHT

PacifiCare Health Systems CIO Maria Fitzpatrick plans to migrate from three disparate legacy systems to a single Web-enabled platform; PMI Group CIO Dan Roberts (below) saw the estimated cost of modernizing his legacy system drop from \$20 million to \$12 million in three years, and now he's tool shopping; Owens & Minor CIO David R. Guzman (bottom) found a migration tool that would uncover the business processes buried in his old Cobol-based system and turn them into Web-ready Java.



Arrivals

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NW	8611	AMSTERDAM	12:45	SEE KL611
KL	611	AMSTERDAM	12:45	ON TIME
NK	126	WEST PALM BEACH	12:45	ON TIME
LH	430	FRANKFURT	12:50	ON TIME
UA	3501	FRANKFURT	1:00	SEE LH430
NK	1452	TAMPA	1:05	ON TIME
SR	124	ZURICH	1:10	ON TIME
AZ	626	MILAN	1:15	ON TIME
NW	7626	MILAN	1:15	SEE AZ6
KL	089	BRUSSELS	1:20	ON TIME
NK	055	MANCHESTER	1:20	ON TIME

Arrivals

1.

AIRLINE	FLY
AA	1596
BA	297
AA	154
UA	1012
KX	3012
TZ	8006
DL	8264
AF	050
LO	001
AA	7491
11	4356
UA	949

Departures

AIRLINE	FLY	ARRIVING FROM	SCHED	REMARKS
UA	896	HONG KONG	9:00	ON TIME
KE	037	SEOUL	9:35	ON TIME
	1504	FT. MYERS	9:45	ON TIME
		MANAJARA	11:00	ON TIME
			11:55	ON TIME
			12:05	ON TIME
			12:10	SEE SK945
			12:10	SEE SK945
			12:10	ON TIME
		ATO	12:20	ON TIME

Departures

AIRLINE	FLY	ARRIVING FROM	SCHED	REMARKS
AA	087	LONDON/HEATHROW	12:40	ON TIME
NW	8611	AMSTERDAM	12:45	SEE KL611
KL	611	AMSTERDAM	12:45	ON TIME
NK	126	WEST PALM BEACH	12:45	ON TIME
LH	430	FRANKFURT	12:50	ON TIME
UA	3501	FRANKFURT	1:00	SEE LH430
NK	1452	TAMPA	1:05	ON TIME
SR	124	ZURICH	1:10	ON TIME
AZ	626	MILAN	1:15	ON TIME
NW	7626	MILAN	1:15	SEE AZ6
KL	089	BRUSSELS	1:20	ON TIME
NK	055	MANCHESTER	1:20	ON TIME

AIRLINE	FLY
UA	896
KE	037
NK	1504
NK	1504
KX	3012
LH	297
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The migration was approved, the money found. Roberts went to work pulling apart his legacy applications in October 2000. He plans to finish by the end of 2003.

SELLING YOUR CEO ON LEGACY MODERNIZATION

American Home Products' legacy system, according to its CIO, was ready for the junk pile. "We were dealing with a system that was weak in function and antiquated in platform, and to redefine our business processes we had to reconfigure the system. It was that simple," says Fadem.

When multiple, disparate systems begin slowing a company's growth, it's time to take action, no matter the state of the economy. But first the executive board has to give the thumbs-up. And when times are tough, selling infrastructure projects can be problematic.

To successfully sell a large-scale migration project to executive leaders, CIOs must present decisive evidence that the project will save money and strengthen the business.

"You have to fully understand the bene-

fits of migrating, and discuss those benefits from a business perspective by showing how the project ties in to the company's strategy," says Al Biland, CIO of Snap-On, a Kenosha, Wis.-based power tool and equipment manufacturer with \$2.1 billion in revenues. "That can be by making the company more operationally fit, by cutting costs or by generating profitable growth."

When Murray became CIO of New York City-based AIG, no one knew how much money the \$46 billion financial services company was spending on maintaining its legacy systems. He organized a total cost of ownership study that served as a benchmark for the cost of maintenance and illustrated how much AIG could save in terms of money and efficiency if the company migrated to a Java-based system. The figure Murray came up with got the attention of his executive board. (Murray declined to share that figure with CIO.)

"I told them that we could be saving 30 percent of what we were spending on maintenance if we moved from mainframe

to thin client," he says. "Their jaws hit the floor. They said, 'It costs us *that* much?'"

Murray presented his board with the ROI of migrating over a five-year period and showed how the project would increase employees' efficiency by reducing the hours spent on manual processes and maintenance. The study indicated that a migration would drastically improve AIG's speed to market and its customer service. That, Murray says, made the biggest impression. "The executive team liked hearing how the project would improve the business," he says. "And they gave us the money we needed."

In a cost-cutting environment, the theory that migrating now will provide a competitive advantage later needs to be advanced with caution, says Wayne Kernochan, managing vice president of platform infrastructure at the Aberdeen Group, a consultancy in Boston.

"CEOs and CFOs have to look at the issue in both the short and long term," Kernochan explains. In order for them to believe that their CIO understands their position, the CIO must acknowledge that

Your Modernization & Migration Toolkit

What your partners and competitors are using to rebuild or replace their legacy applications right now

THIS LIST was derived from interviews with information executives involved in large-scale legacy modernization or migration efforts.

JACADA

Product: Interface Server, Integrator and BPM
Selling point: The Interface Server provides a universal interface layer between new and existing applications. The Integrator and BPM integrate legacy systems with CRM and e-business applications.
Customers: Boeing, Delta Airlines, Volvo
URL: www.jacada.com

MICROFOCUS

Product: EnterpriseLink with Component Generator
Selling point: Users can mine legacy applications for business rules, integrate with new applications or put a new Web front end on their legacy applications.
Customers: New York City Board of Education, Ramada Express Hotels, ABC-TV
URL: www.microfocus.com

RELATIVITY TECHNOLOGIES
Product: RescueWare
Selling point: The tool identifies, isolates and repackages data and business processes

wrapped up in old code.
Customers: Charles Schwab, National City, UBS PaineWebber
URL: www.relativity.com

SEAGULL

Product: Various (BlueZone, Transidiom, TTT, WinJa)
Selling point: The software suite allows users to do one or all of the following: put a Web front end on their legacy applications using a Web emulator or by building a user interface; turn mainframe applications into Java or XML components; translate applications into other languages.
Customers: Portland, Ore.,

Police Bureau, RLI, U.S. Secret Service
URL: www.seagullsw.com

SEEC

Product: Mosaic Studio
Selling point: The tool mines legacy applications for business rules and uses the information to create component-based programs in Enterprise JavaBeans or XML.
Customers: Canada Life International, Nationwide Insurance, Temple University
URL: www.seec.com

—S.K.

chaos or complex system?

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the ROI of infrastructure modernization will not immediately be realized even as he demonstrates that spending now will reduce maintenance costs. At the same time, the CIO can argue that "once we're out of the downturn, the advantages of revamping business practices now will become very clear," says Kernochan.

Plus, the pain of migration, in both cash and time, is not what it once was.

SO YOU THINK YOU KNOW MIGRATION

Eight or nine years ago, there were few options for migrating or renovating applications. CIOs could either rebuild or replace software systems, and either choice was extremely time-consuming and expensive.

In 1992, Snap-On's Biland decided to get rid of the Cobol-based, homegrown IBM mainframe applications that his company

"Legacy applications are a cancerous problem that needs to be excised. It's not a choice. If your business is changing, your systems have to change." -DAVID R. GUZMAN, SENIOR VP AND CIO, OWENS & MINOR

relied on and replace them with a Baan platform. "We had green-screen terminals and not a lot of functionality," Biland recalls. "The legacy applications didn't give us the level of detail around inventory and transaction data that we needed."

Six years and millions of dollars later, the new platform was in place.

Today, businesses have more options than replace or rebuild. There are tools that can do anything, from delving into legacy data, plucking out relevant business rules and rewriting them in Java or XML, to attaching

a Web front end on to an intact legacy database, and everything in between. The tools are fast and relatively cheap, particularly compared with the cost of migrating an enterprise to an ERP platform.

Owens & Minor's Guzman, for example, had no desire to go through an ERP implementation. "ERP projects take too long, they generally don't turn out well, and they cost too much," he says. But something needed to be done with the cumbersome, multilayered, 15-year-old applications that contained the contracts and pricing systems

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for the company. To upgrade, Guzman couldn't go to the original vendor—KnowledgeWare—because it was out of business. And Owens & Minor's heavily customized applications ran OS/2, which IBM no longer supports.

"Legacy applications are a cancerous problem that needs to be excised," Guzman says dramatically. "It's not a choice. If your business is changing, your systems have to change. We needed the ability to do things like multi-currency transactions over the Web, and the old system was completely inflexible."

Still, the old contracts and pricing system contained extremely complex business rules and mathematical computations that were

vital to Owens & Minor's dynamic pricing methods. The legacy system set a separate, unique price for every product for every single Owens & Minor client, taking into account literally dozens of factors. Guzman didn't even want to think about losing that functionality. So he took a gamble on a tool by Relativity Technologies that promised to uncover the vital business processes buried in the old system, turn them into Web-ready components and translate the Cobol and CICS into Java.

Guzman tested the tool on three master files containing EDI maps and customer information. Within six months, the test project was complete.

"It easily would have taken us years to modernize via hand-coding," he says. "And it easily would have cost us tens of millions of dollars to go with SAP or Oracle. So far we've spent about \$1 million on this project."

Guzman is taking the transformation one

step and one application at a time. "We should complete the whole thing within 18 months and for less than \$5 million," he says.

NO TIME LIKE RIGHT NOW

Modernizing legacy applications is a huge task, and it has both risks and rewards. It's easy to rely on what seem like stable systems and hope they'll sustain the business through a recession. But these systems are the technical avatar of a company's business strategy, and if they aren't updated, the business will begin tripping over its own virtual feet. Times are tough, but breaking a few proverbial eggs now could put your company 10 steps ahead of the competition. And that's priceless. **CIO**

Staff Writer Simone Kaplan's legacy applications live in boxes in her basement. How are you dealing with yours? Kaplan can be reached via e-mail at skaplan@cio.com.

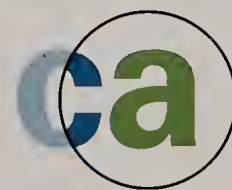
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The Truth About

A man in a dark sweater and light-colored trousers stands in a grassy field at dusk. In the background, there is a body of water and some distant buildings under a dark sky.

The real threat is to critical data, not to property. That's what CIOs should be focusing on.

BY SCOTT BERINATO

Marcus Kempe,
director of operations
support for the
Massachusetts Water
Resource Authority:
"To us, cyberterrorism
is a lower-level
threat."

Cyberterrorism

It is a crisp winter morning. The sun rising over Boston Harbor blinds as it strikes the white oil drums on the industrial edge of Chelsea. Marcus Kempe, director of operations support at the Massachusetts Water

Resource Authority (MWRA), is showing off the crescent-shaped bank of computers that control the flow of water pumped into 2.5 million faucets across eastern Massachusetts every day.

These are the computers that would have to be hacked in order to carry out a cyberattack. And these days, most of Kempe's job involves planning against such an eventuality. But he is not particularly worried about it.

"You're talking about ridiculous barriers," says Kempe, who is a 25-year veteran of the MWRA and oversees its computer infrastructure. "Could a computer attack get us to a high-consequence event? Probably not."

First, Kempe says, a hacker would have to worm into the IT infrastructure. Then, he'd have to hop over a firewall and slip into the MWRA's SCADA (supervisory control and data acquisition) system (the crescent-shaped bank of computers) through one of two very narrow access points. Finally, he would have to plant surreptitious code that would allow remote control of the chemical distribution or even the flow of water itself. (To learn more about the obstacles a hacker would have to hurdle at the MWRA, read "Debunking the Cyberterrorist Threat to Water Utilities," at www.cio.com/printlinks.)

"You're talking about three hacks," says Kempe. "To us, cyberterrorism is a lower-level threat."

Since Sept. 11, it's been almost unpatriotic to

suggest that the threat of cyberterrorism is anything other than dire. But CIOs and security experts are beginning to challenge the assumption that a hack on the nation's critical infrastructure will be the next big terrorist outrage. In fact, cyberterrorism may not be nearly as worrisome as some would make it. That's because it is utterly defensible. And CIOs can play a crucial role in the defense.

DEFINING THE THREAT

As was the case with so many New Yorkers, Sept. 11 inspired Ed Cannon to get involved. Within a couple of weeks of the attack, Cannon, executive vice president and CIO of the global marketing communications company Grey Global Group in New York City, had formed the Information Civil Defense Group (ICDG). He envisions ICDG as a sort of neighborhood watch group, where the neighborhood is the private sector's critical infrastructure and the residents are concerned CIOs. ICDG will stage seminars for CIOs and work with Washington on security standards around critical infrastructure.

So far, Cannon has 100 volunteer CIOs and has met with Richard Clarke, special adviser to the president for cyberspace security, in the Office of Homeland Defense. About 80 percent to 90 percent of critical technology infrastructure resides in the private sector, and that puts private sector CIOs in a unique position of leader-

Reader ROI

- Gain a clear and concise definition of cyberterrorism
- Learn which threats are plausible and which are not
- Understand what the threat of cyberterrorism means to the future of infosecurity

See "How to Plan for the Inevitable" on Page 74 to learn how to respond to cyberterrorism.

ship. They run the systems that need to be protected against terrorist threats.

"We CIOs have the responsibility for managing this," Cannon says. "We have a real role to play."

The first order of business is defining cyberterrorism. Since Sept. 11, threats once considered digital aggravations have been tagged cyberterrorist provocations. Sud-

must fulfill two criteria: a political motivation and a destructive result. But computer attacks usually satisfy only one: the motivation. It's far more difficult to cause destruction with computers. If phones don't work, it's annoying, perhaps costly, even dangerous, but not in and of itself destructive. Even the most often cited cyberterrorist threat—shutting down the Internet—is that really

unlikely—"yes, it's a huge malicious attack, but it's not terrorism."

Both Schneier and Dick agree that the definition of cyberterrorism includes two clear subcategories of cyberterrorist threats.

1) The physical infrastructure threat: compromising critical systems to severely affect critical physical infrastructure, such as power grids, water and sewer systems, dams, hospital equipment, pipelines, communications, global positioning satellites, air traffic systems or any other networked system, which would result in death and/or destruction.

2) The critical data threat: compromising critical computer systems to steal or irreversibly damage vital data, such as the Social Security database, a large financial institution's records or secret military documents, which would result in death, destruction and/or catastrophic economic turmoil.

Of these scenarios, the first—hacking to terrorize utilities—has dominated the cyberterrorism dialogue. But are these systems really networked, and if they are, why did companies and public agencies open critical infrastructure to obvious vulnerabilities?

The Spectrum of Cybermalfeasance

Level of threat to national security: greatest to least

1. INFORMATION WARFARE

State-sponsored use of computers in military action

2. INFORMATION COUNTERINTELLIGENCE

State-sponsored use of computers to gain knowledge on a foe

3. CYBERTERRORISM

Use of computers to cause terror, death, destruction or massive economic turmoil, often by a party not affiliated with any state

4. CYBER ORGANIZED CRIME

Use of computers by a cartel-like group for the purpose of stealing or trafficking, usually money

5. INFORMATION VENDETTAS

Use of computers, usually by an insider or sanctioned by an insider, to sabotage an organization to create public embarrassment or to gain at the expense of that organization

6. CYBERCRIME

Use of computers to steal money, credit card data or personal information for use in extortion schemes or to gain notoriety as a hacker

7. CYBERHOOLIGANISM

Using computers for digital vandalism and low-level destruction, such as website defacement, virus propagation or "hacktivism"—that is, using those tools to get a message across

SOURCE: NIPC

denly, encryption was not a software feature but a weapon in the cyberterrorist's arsenal. Knocking out e-mail was cyberterrorism. One widely quoted security consultant warned of the threat posed by the fans on computers, which can "breathe" and spread deadly bacteria. Is this, then, a form of "bio-cyberterrorism"? The term lost its meaning as it stretched to keep pace with flights of anxiety.

This is how the National Infrastructure Protection Center (NIPC) under Director Ron Dick, a key figure in the government's infrastructure protection scheme, defines cyberterrorism: a criminal act perpetrated through computers resulting in violence, death and/or destruction, and creating terror for the purpose of coercing a government to change its policies.

So to qualify as cyberterrorism, an act

destructive, or just a massive inconvenience? Most experts believe it's the latter. Very few malicious uses of technology qualify under Dick's definition of cyberterrorism.

"It's a bad word. Cyberterrorism is not terrorism in cyberspace because there is no terror there," says security expert Bruce Schneier, CTO and founder of Counterpane Security in Cupertino, Calif. He distinguishes between the term *cyberterrorism* and what he calls "cyberhooliganism," which would include viruses, website defacement and so forth. "Computers can be a vector for terrorism just as the mail system has become a vector for terrorism. But if the mob goes and shoots up a convenience store, we don't call that terrorism. Think of the horrible crimes we don't call terrorism," says Schneier. "So if you shut down the Internet"—a feat Schneier and others warn is plausible and not

SEDUCED BY THE WEB

To answer those questions, we have to go back and look at how infrastructure adapted to the introduction of computers. In the 1970s, computers made it possible to network command and control functions of systems like the power grid or dams or communications switches. Remote control was considered a boon to routine maintenance; it created new efficiencies. Ironically, it was also deemed a good defense against terrorism; the government feared onsite attacks. The notion that someone could manipulate a computer to affect infrastructure was considered a bit of science fiction.

In the 1980s and early '90s, SCADA systems matured and came to dominate critical physical infrastructure. With SCADA, power companies could remotely control functions like load dispatching (balancing transformers so that no one power station gets overloaded). Networked SCADA looked like the

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future of utility maintenance and control.

The Nuclear Regulatory Commission (NRC) was the exception. After a short evaluation, the NRC decided to forbid remote control at nuclear plants. Then in the late '90s, critical utilities were, like everyone, baraged by consultants promising unprecedented cost savings through the Internet.

Kempe at the MWRA recalls meetings during the Web's headiest days, when he and his staff discussed the merits of opening up his systems to the Internet. "It was so tempting," he recalled. "It looked so wonderful—the cost savings, the efficiencies." In the end, the MWRA resisted temptation.

Not everyone did. Many utilities, particularly smaller outfits, and, for arbitrary reasons, power companies, embraced the Web. The ones who dove in either didn't recognize or didn't care at the time that they were also embracing the security weaknesses inherent in the public network.

Today, there remains an unsettling lack of understanding about just how safe utilities are from cyberattack. Even NIPC Director Dick seems to have no idea as to the overall state of networked infrastructure. Asked if he knows which utilities are vulnerable, Dick says, "I don't know that anyone knows."

WHY CYBERTERRORISM IS NOT WORTH THE WORRY

This much is known: Some critical computers are vulnerable. In 1997 a hacker shut down control tower services at the Worcester, Mass., airport. The incident didn't cause any accidents, though service was affected. Three years later, a General Accounting Office report suggested the Federal Aviation Administration computers were vulnerable. And in Maroochy Shire, Australia, in April 2000, a disgruntled consultant-turned-hacker compromised a waste management control system and loosed millions of gallons of raw sewage on the town.

The hacker had deep knowledge of the system, and he had stolen sewage-control software on his laptop. He spent two months getting into the system from the outside.



Sept. 11 inspired
Ed Cannon, executive
vice president and CIO of
the Grey Global Group,
to get CIOs involved in
civic defense.

The good news—besides the lack of human casualties (marine life died)—is it took this former insider 46 tries to unleash the waste; the bad news is that those managing this critical infrastructure missed his first 45 attempts.

It wasn't cyberterrorism. But even so, many view the cyberterrorist threat to computer infrastructure as largely implausible.

Why? For one, experts say terrorism is like lightning. It takes the path of least resistance to its end. And, right now, it's easier to blow something up than to figure out how to damage it by hacking into and manipulating a computer system.

Take the MWRA. After Sept. 11, Kempe's first order was not to lock down computers; it was to erect Jersey barriers, weld manhole covers and call in the National Guard. Terrorists want to make an immediate impact, and cyberterrorism is largely *quiet*.

"Terrorists need to make a big splash, to draw headlines," says Mike Hager, vice president of security at Oppenheimer Funds in Engelwood, Colo., who was at the World Trade Center Sept. 11 and escaped after

both planes hit. "The type of cyberterrorist attack pulled off would have to be huge." According to Hager, the fact that a hacker turned some lights out wouldn't convey any terrifying message. "The terrorists [on Sept. 11] could have hacked into the power system of the World Trade Center." They didn't, because that wouldn't have made a statement.

Security expert Rob Rosenberger feels much of the rhetoric about cyberterrorism is political posturing to gain funding. "The information-war people say this cyberterrorist threat is out there, but they never provide any plausible scenarios," says Rosenberger, director of Vmyths.com, an independent website that squelches virus myths and general computer security hysteria. "I'm asking for reality, and I'm not getting it."

THE REAL THREAT

Rosenberger fears the second scenario far more—cyberterrorist attacks that destroy critical data. And he's not the only one.

The general state of data security is woe-



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ful, again, thanks to the Web. Despite unprecedented spending on security in the past three years, more hacks than ever are successful, they are easier to create and carry out, and they produce ever more devastating results. Most of those threats are not through disablement but rather corruption: tricking a system into doing the wrong tasks while it supposes it's working normally.

Parasites—tiny computer programs that live in databases and slowly corrupt the data and its backups—could wreck a crucial database like Social

Security. Or a hacker could penetrate a pharmacy chain's network or hospital database, causing fatal medical errors when a patient takes a prescription drug. If you want to raise hell on airlines, you hack the reservation system, says Schneier. If you want to cyberterrorize airlines, you hack the weights and measures computers that control planes' fuel and payload measurements.

Such "fringe systems" are seen as the most vulnerable to data corruption. "The threat to data is absolutely more of a concern," says Hager. "It's so much easier to attack, and there are so many more targets."

In any case, the threat of cyberterrorism is deemed most plausible as a supplement to a larger terrorist attack. In other words, we shouldn't think about cyberterrorism as the next great threat after the physical horror of airplane hijacking and the biological horror of Anthrax. Rather, cyberterrorism is something smaller that will be used to amplify those far greater horrors.

"I keep going back to Sept. 11 and wondering how bad it would have been if the Code Red worm hit at the same time—the level of anxiety and panic that would have caused," says Grey Global's Cannon. "Having e-mail was one of the saving graces of that day."

The good news is that protecting against any security threat protects against cyberterrorism. Kenneth Niemi, CIO of the Min-

nesota State University System, learned that recently when he faced a two-and-a-half-week employee strike. It turned into a de facto antiterrorist exercise. Niemi found himself planning a defense against disgruntled employees who possessed the two keys to any security breach—knowledge and access.

Niemi's greatest takeaway from this exercise was how much physical and IT security should and can intersect. (For more information on this, read "How to Plan for the Inevitable," Page 74.) Since Sept. 11, the trend toward combin-

ing aspects of IT security with onsite security has accelerated. "We made key card access enforceable 24 hours a day. We require certain employees to take their laptops home in case we need to deal with a situation remotely," Niemi says.

Niemi also formalized the process of registering guests who enter his building and is adding computer lab surveillance.

Cannon has also tightened physical security by revoking several employees' access to the data center. He also moved many consoles out of the data center, all in an effort to reduce traffic near critical systems.

The MWRA already has tight integration of physical and network security. To begin with, the computers are in a locked room, which is accessible by key card and manned 24/7. Visitors check in and check out at the front desk, and after visitors leave, their host sends a memo to senior management detailing the visit.

SCADA connects through a private line (soon, via microwave) to pump stations and reservoirs. If something goes wrong at a water facility, an alarm sounds both onsite

and at the SCADA operations centers. The alarm also flashes on the computers, and it can't be shut off until a formal acknowledgment of the alarm is made and physically logged by a person with clearance to do so.

"Roving crews" periodically go to MWRA pump stations and storage sites to check the integrity of the facilities and their connection to the control computers. Most of the sites are under surveillance.

"I see IT and these physical security rules meshing more and more," says Cannon. "Especially when you talk about disgruntled employees and screening. But it's a fine line. We want to treat employees like adults. Cut off too much access and you're saying you don't trust them."

Besides meshing physical and IT security, two other measures CIOs can take are to get involved and share information with each other. Joining Cannon in the Information Civil Defense Group, meeting with government groups like the National Infrastructure Protection Center, raising awareness of the cyberterrorist threat within one's own company and opening security dialogues with peers are all important steps to take.

Six months after the Sept. 11 attacks, there's a great deal of optimism among technology professionals about their ability to deflect the cyberterrorist threat.

"[Awareness] is a big reason for optimism," says Alan Paller, security expert and director of research at the SANS Institute in Bethesda, Md. "The operations guy is getting a call from the vice chairman, someone really high up, who's asking what the company is doing about this threat. That conversation has never happened before. Underneath there are still a lot of vulnerable systems out there, but I believe cyberterrorism is very hard to pull off."

"My newest speech is about this topic, and it's not 'look how life is ending,'" Paller adds. "It's optimistic. There are many more reasons for optimism now than there were six months ago." 

Got any cyberterrorism stories to tell? E-mail Senior Writer Scott Berinato at sberinato@cio.com.

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uses of technology
actually qualify
as cyberterrorism.

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How to Plan for

Think you can't afford to create an incident response plan? Think again. Here's a budget-conscious guide to getting started.

BY SARAH D. SCALET



When a customer stumbled upon a security breach, Barry Woolsey, CIO of Fleet Credit Card Services, got a chance to test his incident response plan in real-time.

the Inevitable

or Barry L. Woolsey, CIO of Fleet Credit Card Services, the first public test of his plan for dealing with security incidents began not with a hacker, a cyberterrorist or a disgruntled employee. It started

when a curious customer logged on to Mycard.Fleet.com to make a credit card payment—and inadvertently discovered a security hole that would earn headlines on MSNBC.com and force Fleet to shut down its site for five hours.

Logging in on a Friday afternoon, Jonathan Bryce, a 20-year-old online operations manager, noticed that the webpage where he accessed his credit card account had a long identification number in the URL. Wondering how Fleet kept track of transaction history, he entered a random number. To his shock, he pulled up someone else's transaction.

"The hole allowed you to see people's personal information," says Bryce, who works for Rackspace Managed Hosting in San Antonio. "Mainly it was nonsensitive information, but there were several cases where it was personal information like Social Security numbers, account numbers and addresses."

Alarmed that his account information could be compromised, Bryce called the customer service line at Fleet. After being transferred several times, he was told that someone would call him back on Monday.

That wasn't good enough. Bryce called the media, and hours later both MSNBC.com and

The Boston Globe online had picked up the story.

Behind the scenes at Fleet Credit Card Services, the FleetBoston Financial subsidiary north of Philadelphia, Bryce's phone calls and the ensuing media coverage set in motion an incident response plan long in the making. It took more than five hours from the time Bryce called Fleet to the time Woolsey found out. So while Woolsey is generally happy with the way the plan unfolded, he acknowledges that it could have worked better—a whole lot better.

At least Fleet had a plan. Throughout most of the business world, incident response planning is one of those best practices that rarely gets done. That's because of its vague underlying assumption: *Something could go wrong.*

Obviously, prevention is key. But in a world where security is nothing if not fallible, knowing how to respond to a security incident—be it a computer worm, mistake, hacker or the mere suspicion of a problem—can save a company time, money and even its reputation. Indeed, a better response from the customer service representatives at Fleet could have kept the problem from making headlines in the first place.

Nevertheless, the sad fact is that Fleet handled the situation better than many companies

Reader ROI

- ▶ Read about the real-life test of an incident response plan
- ▶ Learn why incident response planning is worth all the pain
- ▶ Find out how planning ahead can save time, money and your reputation

See "The Truth About Cyberterrorism" on Page 66.

could have. Outside of the heavily regulated health-care and financial services industries, experts say, few companies are prepared to deal with isolated security incidents, let alone calculated attacks from organized crime or even, perhaps, cyberterrorists. (For more on this, read "The Truth About Cyberterrorism," Page 66).

"There's only now the beginning of awareness that this thing is needed," says Jay Ehrenreich, senior manager in the cyber-crime prevention and response group at PricewaterhouseCoopers in New York City. "Companies do come to us to help them develop incident response plans, but lots of times it's only after they've been burned."

And getting burned is expensive. Companies have spent billions of dollars recovering from malicious worms such as Nimda and Code Red. And in a 2001 study by the Computer Security Institute and the FBI, respondents who could put a dollar amount on the cost of a security breach averaged more than \$2 million in financial losses.

Not everyone has to learn the hard way, though. Here are the steps to take to jump-start the process with less time and effort than you might expect.

1 PULL TOGETHER A TEAM. As long as upper management is serious about security, the first step of incident response planning—pulling together an incident response team—costs next to nothing. "Many companies envision this fully dedicated, highly paid SWAT team doing nothing, waiting for an emergency," Ehrenreich says. "It's really not that way. It's almost like a volunteer fire department, where people have other duties, but when there's an emergency people respond to it."

The night Fleet learned of its security breach, Woolsey, COO Susan Gleason (who is no longer with the company), CEO Patrick J. Coll, and representatives from the legal team, communications department and FleetBoston gathered on a preestablished bridge telephone line to discuss how to minimize the damage to Fleet's customers and

its reputation. Meanwhile, the IS team worked to analyze the security breach, find out what information had been accessed and fix the security hole. Based on the IS team's findings, the fraud department then called customers whose personal information had been compromised.

That's pretty typical of the groups that need to come together after a security breach, although some organizations would have added human resources to the mix. The list of team members can get long, but not everyone needs to be involved with every situation. Also, some people are responsible for fixing the problem; others just need to know what's happening. The incident response group will be closely aligned with or perhaps even the same as the business continuity or disaster recovery teams.

Once team members know their role, a project manager should create a list with multiple ways to contact team members 24/7. The list should also include contact information for security vendors, Web hosting companies and other relevant technology providers, and it should be available in hard copy at every business location and at people's homes. The need for that last recommendation was painfully illustrated on Sept. 11.

2 COORDINATE YOUR EFFORTS. The plan can't stop with that group. As the Fleet example illustrates, everyone across the organization—right down to the newest person at the call center—needs to know how to react to a potential security breach. That's why there needs to be a centralized way to report, respond to and track incidents. Customer service representatives need to know who to call about a problem; security

employees need to know when to call the CIO; the CIO needs to know when to call the CEO; and someone needs to track what's going on organizationwide so that different

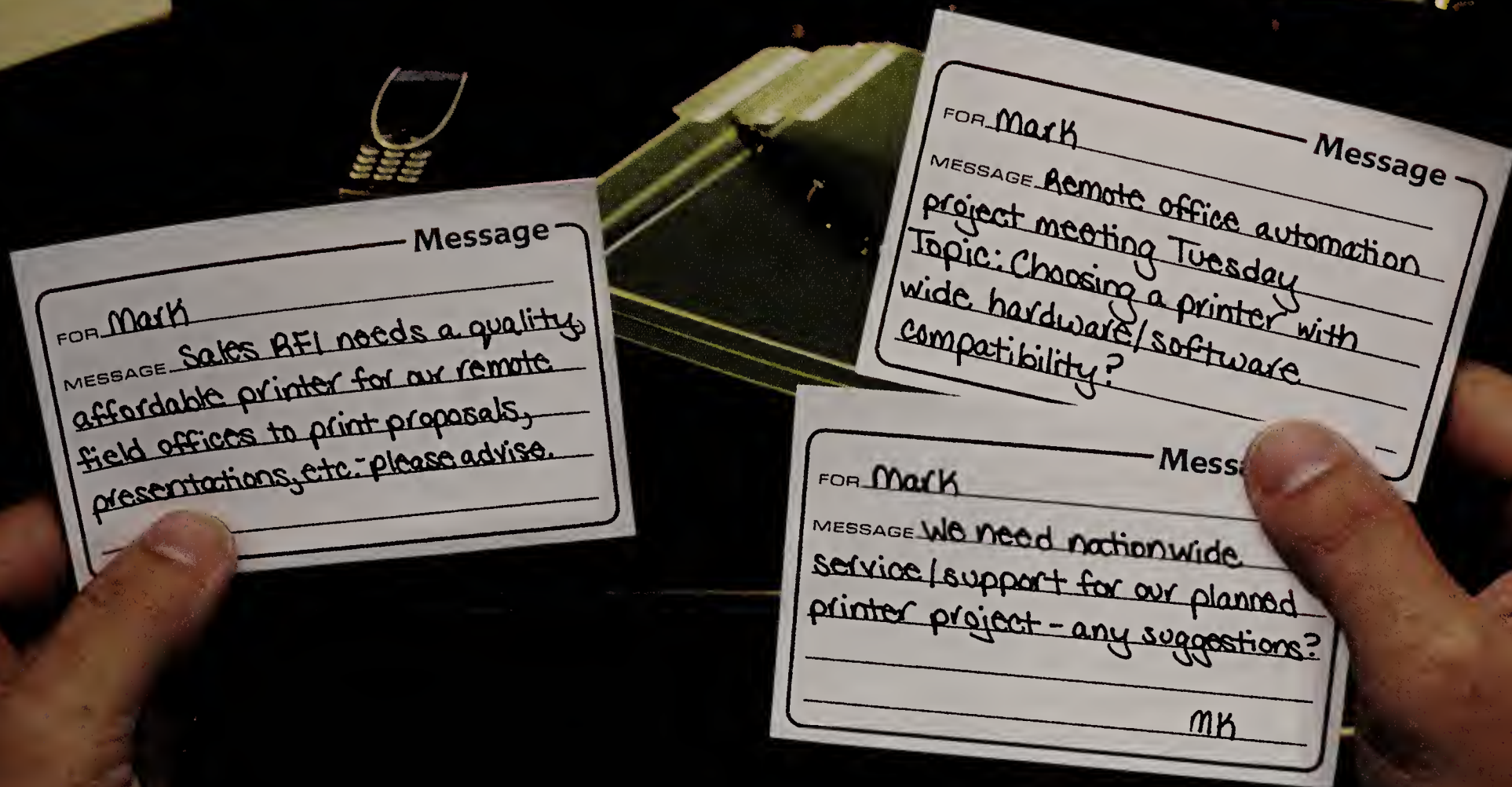
business units can prepare for attacks. "A good bit of incident response is coordination," says David Nelson, deputy CIO at NASA, who's in charge of the agency's IT security. "You want to be sure that the right people have the right information at the right time."

A security incident at any of NASA's centers is first reported to an on-site IT security manager. The incident is put into one of seven categories

ranging from a legitimate user misusing the system to an access problem in which a hacker has obtained the password of a systems administrator. Anything deemed serious is reported immediately to the centralized NASA Incident Response Center (NASIRC), which shares this information with Nelson. If the incident could be criminal in nature, NASA's inspector general's office also gets involved.

During large-scale attacks such as the Code Red worm, NASIRC sets up a conference call with IT security managers from all the centers. "We would in real-time go over what's happening, what's the damage, what's being done, and do we have to take any extraordinary measures to protect ourselves," Nelson says. "If we didn't have [this system] in place, we'd be like sitting ducks without any means of finding out that the hunters are shooting at us. Our experience is that any substantial attack hits a lot of computer systems or IP addresses or places almost simultaneously, and so early awareness can help us take appropriate measures before we're all dead. That first gun goes off, and all the ducks fly out—maybe one got killed, and we're sorry about that, but the rest of them are all alive."

Everyone in
your company—
right down to
the newest person
at the call center—
needs to know
how to react
to a potential
security breach.



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GRANT AUTHORITY. One of the most political parts of incident response planning—but one that can save precious time if an attack is successful—is deciding ahead of time who's in charge of incident response and which people could pull the plug on the website or network if need be. But the fact that some people high on the corporate food chain have to relinquish control causes friction, says Rebecca Bace, a National Security Agency alum who wrote *Intrusion Detection*. Unfortunately, there simply might not be time to contact everyone.

“The velocity of [an intrusion] proceeds in seconds or minutes, rarely hours. If management wants people to be able to respond effectively to quick-moving attacks, they’ve got to empower them to shut certain portions of the system down,” says Bace, who is now a faculty member for The Institute for Applied Network Security in Waltham, Mass.

The Georgia Student Finance Commission in Tucker, Ga., learned that the hard way—but in slow motion. Bill Spernow, the commission’s new chief information security officer (CISO), was hired after a public security snafu in which personal information about HOPE scholarship recipients was disclosed on the Internet. The organization was painfully slow in responding to the breach, caused by a technical error, because there was no one in-house who could take control of the situation and shut down the website. Now Spernow is in control.

“You can do this [incident response planning] on the cheap as long as senior management has come to the decision that they’re going to delegate this to one person who can make a decision,” says Spernow, a former Gartner analyst who says he took the job because he wanted to apply his advice in the real world. “That will always be the biggest bottleneck whether you’re a Mom and Pop or a Fortune 100. It ends up being a very intense political discussion that brings in lots of fears and control issues. And once you’ve done that, you’ve handled 60 percent of the problem.”

Cybersecurity—Cost and Effect

Here are the technologies, processes and strategies that will help you run an airtight system and give you the most for your security dollar

WHAT YOU CAN DO

Install basic hardware and software: firewalls, antivirus programs, passwords, etc.

Cost: \$\$\$ Security rating: ●●

Buy advanced hardware and software: encryption, token authentication, digital certificates and signatures, keystroke loggers, etc.

Cost: \$\$\$ Security rating: ●●●

Hire or train programmers to write security code.

Cost: \$\$\$\$ Security rating: ●●●●

Hire or reassign staff to create and enforce security policies.

Cost: \$\$ Security rating: ●●●

Dedicate one staffer to ongoing maintenance of security systems.

Cost: \$ Security rating: ●●●●●

Educate your staff and promote awareness companywide.

Cost: \$ Security rating: ●●●●●

Schedule regular virus and patch upgrades, firewall reconfiguration, PC security audits, etc.

Cost: \$\$ Security rating: ●●●●

Conduct regular security and penetration audits or assessments.

Cost: \$\$\$\$ Security rating: ●●●●

Pay consultants.

Cost: \$\$\$ Security rating: ●●

Outsource your worries.

Cost: \$\$\$\$ Security rating: ●●●●●

WHAT YOU CAN EXPECT

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Another low-cost, highly effective way to immediately improve security.

Although this often requires software or services to automate the updates, it's well worth the cost to make sure critical updates don't fall by the wayside.

Expensive but necessary. White Hat hackers will give you detailed reports of your security landscape and suggest ways to improve the view.

Security consulting, while often required for projects or for insurance, is expensive. It's also hard to find consultants who have both technical and business expertise.

Outsourcing is quite expensive, but it includes service guarantees that the enterprise will remain secure no matter what.

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Too many incompatibilities.

Too little bandwidth.

Too many different providers.



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4 **READY YOUR IT RESOURCES AHEAD OF TIME.** No doubt about it, the technical aspect of intrusion response is the most complicated part. The IS team or an outsourced monitoring service has to be able to identify problems when they do occur—by examining logs for unusual behavior, looking for vulnerabilities, watching for faulty configurations and monitoring intrusion detection systems, which can generate a tremendous number of false positives. “You have to know when someone’s attacking you because if you don’t know, you can’t do anything. And that’s the hardest part,” says Michael Young, CISO and vice principal of State Street Global Advisors in Boston.

Once a problem is identified, IT staffers need to be able to look at system logs and analyze exactly what happened. Finding and preserving evidence is the key to fixing a problem and keeping it from happening again. Also, knowing exactly which files were compromised will help a company ensure data integrity and figure out which customers, employees or business partners may be affected. (To learn more about computer forensics, read “IT Autopsy,” March 1, 2001, available at www.cio.com/printlinks.)

Whether this can be done in-house or needs to be outsourced depends on the size of the company, how attractive a target it is to hackers and how sensitive its information is. As a general rule, the more crucial and extensive a company’s information assets,

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For more information, read the **“CIO CYBERTHREAT RESPONSE & REPORTING GUIDELINES”** at www.cio.com/printlinks. Included are:

- **SPECIFIC GUIDELINES** on how to prepare and implement an incident response plan
- **AN INCIDENT REPORT FORM** to include with your response plan
- **A COMPREHENSIVE LIST** of local law enforcement agencies

the more sense it makes for executives to keep security operations in-house.

Fortunately, though, the more a company works to prevent security problems in the first place, the cheaper it will be to deal with them once they do arise. “An ounce of prevention is worth a pound of cure, and that absolutely applies in the cyberintrusion space,” says Bruce Moulton, former CISO at Fidelity Investments and a cofounder of the Financial Services Information Sharing and Analysis Center.

5 **DECIDE WHEN TO INVOLVE LAW ENFORCEMENT.** Reluctant to call the cops and risk having customers and stockholders find out about a problem? That’s normal. But if a situation gets bad enough—a key competitor steals intellectual property, a hacker publishes customer records or a former employee takes down the website—you might change your mind. And in some cases, publicity will ensue anyway. Executives can save time and heartache by discussing ahead of time what situations might cause them to call in law enforcement. For most companies, these situations involve serious financial loss that law enforcement may help recover in damages, or a high-profile case that’s already publicly known.

At the University of Washington Academic Medical Center in Seattle, which suffered a security breach that was reported by *The Washington Post* and other news outlets, CIO Tom Martin initially decided not



Bill Spernow, chief information security officer of the Georgia Student Finance Commission, was hired to correct an embarrassing security snafu.

PHOTO BY SONNY WILLIAMS



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Bruce Moulton, cofounder of the Financial Services ISAC, says that an ounce of prevention in cyberspace is worth a pound of cure.

to call the FBI because he didn't think the hacker had accessed any patient data. But as soon as he discovered otherwise, he says, he changed his mind.

"There is a stigma to being a victim because it implies some level of incompetence, but really it's an inevitability. As we become more Internet-based, it's only a matter of time before you have problems," Martin says. "To underreport is a disservice to the industry. It's building in an infrastructure of illegal activity, and we just decided we won't tolerate illegal activity or accept it as a given."

The threat of organized cyberattacks or even cyberterrorism has made this even more of a concern, many experts say, because law enforcement needs to be able to watch for trends or attacks that spread across companies and industries. For research purposes, Carnegie Mellon's CERT

Coordination Center tracks security incidents and asks that companies report even unsuccessful attacks. (For more information, visit www.cert.org.)

Increasingly, companies are also being encouraged to contact law enforcement outside of a particular security event. By talking with law enforcement ahead of time, a CIO or CISO is better equipped to evaluate the impact of an investigation on business operations, determine whether law enforcement might be able to help and find out how sensitive information is handled by the authorities.

"When we get the call [after a security incident] has already happened, it's difficult for us to help," says Bob Weaver, head of the Secret Service's New York City Electronic Crimes Task Force, which was made a national model for information sharing

between law enforcement and business by the U.S.A. Patriot Act, passed by Congress shortly after Sept. 11. "Call who best serves you. It may not always be federal—you may be best served by a local police department, a state police department, an attorney general. If you don't have [that relationship] and an incident does arrive, it's like driving your car down the street and trying to change the tire while you're doing it. And you don't want to call 1-800-Law-Enforcement. You don't want to dial 911. You want to know who you're bringing in." (For a list of law enforcement contacts, see www.cio.com/security/response.) Once in place, incident response plans are morphing, living documents. As Fleet Credit Card Services learned, there are things to be tested and tweaked and learned from—processes that become better and easier to justify to management after they've been used.

So the next time that organization has a security incident—be it a malicious worm or something more ominous—the company will be that much better prepared. CIO Woolsey is working on making sure customer representatives know how to handle security calls from alarmed customers, and since the security hole was in a vendor's application, he's also instituting tighter controls around third-party software. He's heartened by the fact that to the best of his knowledge, no customers have closed their account because of the incident.

"I guess the one lesson I would walk away with is never assume that anything is perfect," Woolsey says. "What you need to do is understand that you can't plan for everything, so you need to have a contingency that's broad enough and open enough that it can in essence deal with everything." **CIO**

How far along is your incident response plan? Tell Sarah D. Scalet, senior writer and security editor, at sscalet@cio.com.

A **CIO Focus** guide to incident response, "IT Security Breach: How to React, Recover and Seek Recourse," is available for purchase at www.theciostore.com.

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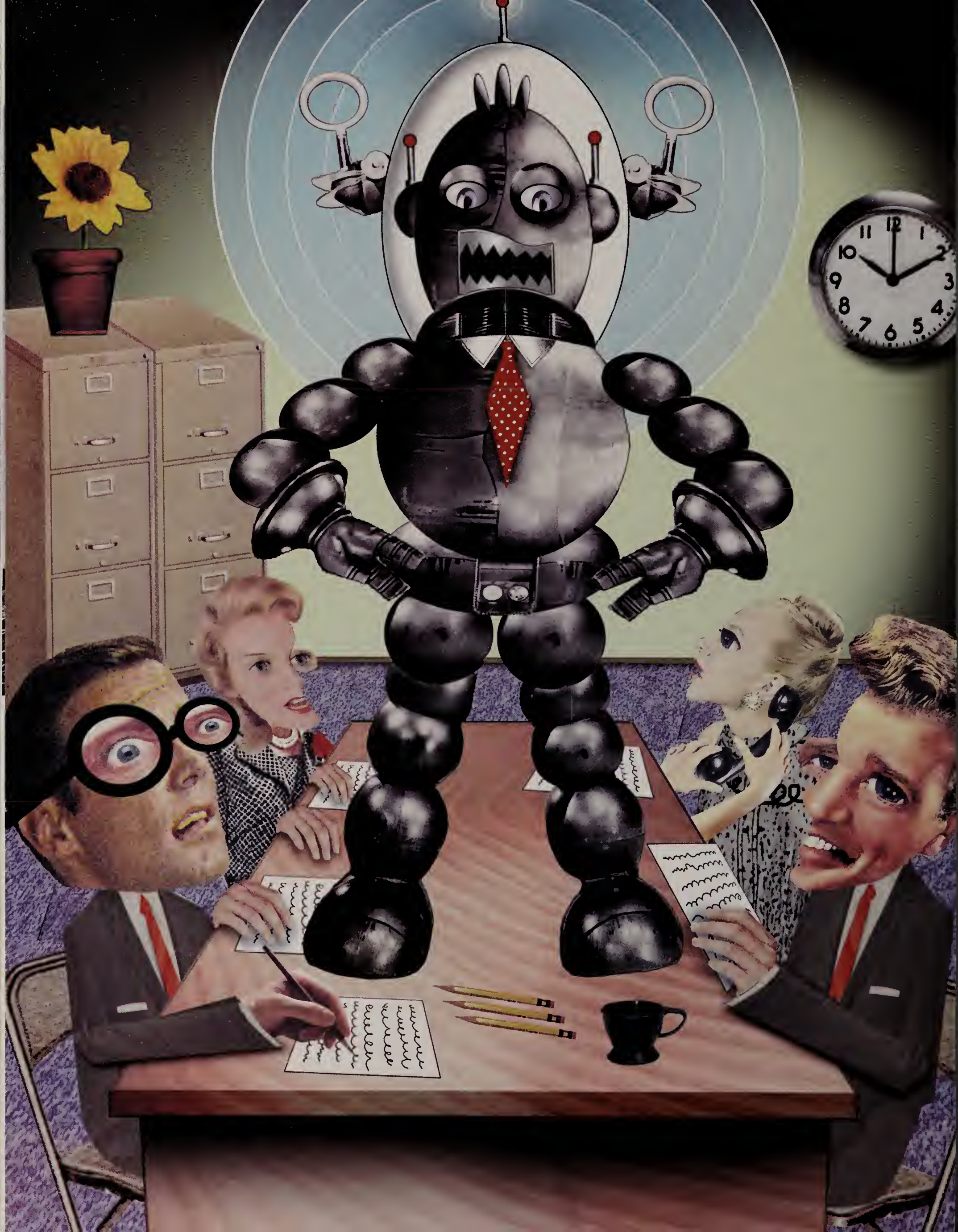


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BY PRESTON GRALLA

WHEN INTRIA-HP OF TORONTO—A JOINT OUTSOURCING VENTURE BETWEEN HEWLETT-PACKARD

and Canadian Imperial Bank of Commerce—was formed, its executives had a daunting task ahead of them: Transform an IT department that had been a cost center into a revenue center selling IT services to banks.

To aid in the transformation, the executives turned to professional services automation (PSA) software, which automates work assignments, billing and invoicing, time sheets and similar kinds of labor. The software is designed for organizations that provide professional services, such as global IT shops, financial services organizations, consulting firms or organizations with many far-flung consultants around the world.

In theory, the tool seemed ideal for Intria-HP's overhaul. The reports PSA software creates can help a company closely track what work IT employees and consultants are doing, see what resources are free at any given time, and assist managers in determining whether their workers are ready to take on new assignments. The idea is to allow managers to more effectively use their existing workforce.

But Intria-HP soon found that

theory clashed with practice. The system just wasn't working, says Bent Fink-Jensen, an IT executive whose official title is director of process and knowledge management. And it wasn't working for a very simple reason: People weren't using it. Rather than learn and adapt to a system in which they saw few benefits, people simply reverted to the old ways of doing things—and so the promised benefits of the software, which cost \$345 per license (\$550 in Canadian dollars), weren't forthcoming.

Interviews with other CIOs who have used PSA software, and with consultants familiar with the technology, reveal that Intria-HP's story isn't an isolated one. While PSA software holds out the promise of increasing the effectiveness of businesses that provide professional services, employees often balk at using it, and the investment may be wasted.

"You can't just drop this technology on your workforce and have people magically use it," says Dave Hofferberth, research director responsible for the PSA practice of the Aberdeen Group, an IT resource and consulting group based in Boston. "Executives so

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- ▶ Find out what to do if you meet employee resistance

far have loved this. But if it's an executive mandate, you'll typically get resistance."

To forestall such resistance, CIOs must do some homework before they even invest in this kind of software. To begin with, they should have a thorough understanding of their company's corporate culture and how the company assigns work. Companies that provide consulting or Web design services are often staffed by creative types who don't cotton to a lot of structure, and may balk at attempts to compartmentalize their work. On the other hand, IT organizations that have employees who like structure and order may embrace workflow software.

CIOs also have to understand how employees report their progress on assignments, note time on each project and bill for their work. If such business processes are not in place and clearly spelled out before the software is in place, it isn't going to work. All the technology in the world cannot compensate for a disorganized work environment, as Fink-Jensen discovered.

Culture Shock

Since Intria-HP began life as the product of a merger between a hardware company and a bank, it had no in-house store of knowledge to turn to in setting up the right kind of processes for a consultancy. "We weren't set up to have a handle on getting [consulting] work into the organization and



users. But it didn't take long for the problems to start piling up. It started at the most basic level: People simply didn't use the software.

"Under the old way of doing things when we were owned by the bank, there were a lot of back doors for getting work done," says Fink-Jensen. "And those back doors stayed open—so people in IT were doing work when requested, but without reporting it [in the software]." And without people reporting their work into the software, he says, there was no way for managers to use it to manage and control projects.

In fact, experts say, the biggest obstacle to implementing PSA software has nothing to do with technology—it has to do with

out what jobs have to be done that day. He would then fill out Web-based time sheets for when each task must be accomplished. "You need to explain to the people doing the work why [PSA software] is important, to let them know that it can make their lives easier," Hofferberth notes.

There is another downside: The use of the software could lead to less face-to-face interaction with colleagues, Hofferberth says. Even so, he believes that the increased efficiency, faster invoicing turnaround and sophisticated reporting features of the software are well worth the effort. And he notes that people who work in IT departments "tend to like more structure than do artists or public relations people" and are often happy with the greater structure it imposes.

Bonnie Nardi, research scientist at Agilent Laboratories, and an anthropologist who has studied how technology is used in the workplace, is not so sure. She is concerned that the resulting decrease in face-to-face interaction could take its toll on an organization. (For more on Nardi's ideas, read "Software for the People" at www.cio.com/printlinks.)

"There's some magic in interaction, and any software that cuts down on that will cut down on efficiency and creativity," Nardi says. Specifically, she notes that it could cut down on creative solutions that come out of brainstorming sessions, informal mentoring among employees and team building.

The biggest obstacle to implementing PSA software has nothing to do with technology—it has to do with corporate culture.

knowing who the work was assigned to," Fink-Jensen says. "So we had difficulty in knowing what commitments we could make and what we couldn't make."

To solve the problem, the company turned to Account4 PSA software, now known as Lawson Professional Services Automation. They began to roll out the software in August 2000, and by January 2001 they had 900

corporate culture. People may not like the idea that they have to document everything they do, and they may balk at finding out about their daily tasks from software rather than directly from superiors.

Using the software will mean that people's work lives become much more structured. An IT worker, for example, might log in to the PSA system in the morning and find

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Ten Steps to Choosing the Right PSA Software

There are many professional services automation (PSA) vendors making many promises. Here's how to cut through the hype and choose the right one.

1 Assemble a selection group composed of people from every part of the organization who will use the software. Make sure to balance it geographically. Not only will this give you the best snapshot of what you need, but it'll help ensure buy-in after you choose the software.

2 Come to an agreement about the business processes that will be automated before looking at software. You may find that this step alone, even if you don't choose any PSA software, will help your business run better.

3 If you do decide to go ahead, you can then select a package that has the specific features you need. Joe Federer, vice president of professional services for Dayton, Ohio-based Teradata, recently went through a time-consuming process of selecting PSA software. He found that Noviant software was strong in resource management but left a lot to be desired when it came to time and expense entries; while Account4 was excellent in project accounting but less stellar in knowledge and resource management.

4 Factor in your company's culture. The best PSA software in the world will be worthless if you choose one that's inimical to your corporate culture. For example, if people are used to the freedom of choosing their work and working conditions, be careful not to choose a system that will destroy what people value most about their jobs.

5 Decide if you want an end-to-end, all-in-one package or one that integrates with your existing HR, billing and other systems. Small companies often choose to go with an all-in-one package, while large ones may choose a point solution that takes only certain modules and links them to existing systems.

6 Match the PSA solution to your company size and the industry you're in. Some solutions are better for small companies, some are designed for health-care enterprises and others for government services. Ask for a list of organizations using the PSA software you're considering, and see if they are like yours. And then talk to existing customers, without the vendor present.

7 Decide on your platform of choice. Will it be a thin-client Web-based one? A more traditional client/server model? These days most people agree that Web-based is the way to go because it will then be accessible where employees or consultants are working.

8 Integrate it into your existing architecture. It must easily integrate into your existing databases and all of your back-end systems.

9 Start small. Kazim Isfahani, principal analyst with the Robert Frances Group in Westport, Conn., recommends that a company not start off by buying and then installing and implementing the whole gamut of professional services automation modules. "Put in the most critical components for a small number of users, then to a larger number of users, and then go on to another component," he says.

10 Don't underestimate how long it will take to implement the package. IT executives who have installed PSA software say it can take six to 18 months. Ken Brzozowski, vice president of the Corporate Technology Group at Merrill Lynch, says, "It may seem straightforward, so people try to accelerate implementation, but that causes delay in the long term."
-P.G.

And if people are assigned jobs and sign off that they've finished jobs primarily via web-pages, as you do with some PSA software, "then that's all that people will do," Nardi says. "They won't interact, and they'll be plugged in to a webpage all day.

"A lot of really amazing people in organizations in America do far more than they are paid for. When you take away the 'invisible incentives' [of interacting with others], you won't get the best out of people," she says.

At Intria-HP, the problem of employee resistance was exacerbated by the fact that the software itself was somewhat difficult to

use. So when people did report their work via the software, they often put in the wrong work codes. Those codes are of vital importance because if improper codes are put in, there's no way to track work properly or create usable reports. And people would sometimes book their time as nonbillable when it should have been billable, leading to "revenue leakage," in Fink-Jensen's words.

Managers were also equally confused about how to use the software, and so they weren't able to generate the workflow reports they needed.

Fink-Jensen attributes the problems to three causes: the difficulty of learning the

software, not providing enough training and not having adequate understanding of the ways in which work flows through an organization before implementing the software. "We had done a fair amount of training," Fink-Jensen says, "but we found out that we had to go back and follow up because they didn't get it the first time around."

The company currently has 900 people using the software, and by taking more time to carefully document how work assignments are handled, Fink-Jensen says the problems have been straightened out. The software is now proving valuable to the business, he says, primarily because it allows the company to

DB2. software

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bill for more hours and lets managers utilize their workforce more efficiently. But it took a year to get it straight, Fink-Jensen says, and warns other CIOs to spend more time on training than they think they will need.

If at First You Don't Succeed...

Scott Kitlinski, CIO of ePresence, a professional services company, echoes Fink-Jensen in saying that a big problem with PSA software is getting people to use it. When Kitlinski joined ePresence two years ago, the company was undergoing a dramatic change. It had been known as Banyan Worldwide and was purely a product company (it made and sold a networking operating system and directory product). As ePresence, it was transitioning itself from a product company into a services organization that provided e-business consulting. But in its new configuration, the software applications it was using didn't allow the company to create workflow reports and merge new clients into the business. Kitlinski decided that PSA software would be ideal for the Westborough, Mass.-based company's new focus. He spearheaded a group that chose Evolve PSA software, and in February 2000, he started the implementation. A few months later, however, a major problem became apparent: People weren't using the software.

To begin with, salespeople weren't entering data, Kitlinski says. "The simple process of getting salespeople to share pertinent information about clients was a pretty big change because they were used to the idea that they owned the customer."

It wasn't only salespeople who weren't using the software though. Resource managers—those in charge of determining what resources are available for projects at the company—weren't using it either. Because of that it was difficult for other managers to

The danger of workflow software is that it cuts down on face-to-face interactions.

know which workers were available for projects. Workers were either underutilized or misutilized, says Kitlinski, a potentially serious problem in a consulting business.

"All you really have in a consulting business are people and their experience, and if they're not being utilized properly, then your profitability suffers," he notes.

ePresence spent months trying to get its employees to use the Evolve software. And in the midst of the implementation, the software was revised in a way that made it even more difficult to use; the upgraded version, for instance, no longer allowed its users to

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get an overview of all the lines of business at once, Kitlinski says.

So ePresence dropped Evolve and halted the PSA project. Kitlinski declined to say how much money the company wasted on that endeavor. But several months later, the company chose another vendor, Change-

point, to install PSA software. In the interim, he says, the software had gotten easier to use and integrate into an organization. And he had learned from the first go-around that it was vital to get people on board first.

"The key the first time around is that people weren't using it because they didn't see a reason to use it," he says. So with the ChangePoint implementation, he spent much more time up front detailing the benefits of the software—for instance, showing how it would allow the company to better manage projects and time and make sure people were doing the work they want to do.

The new software has already helped in a number of ways, Kitlinski says, including better matching people's skills with the kinds of projects they'd be most effective with, and having more accurate and timely financial information that allows company officials to better manage the business.

The lesson learned? When it comes to PSA software, organizational issues are more important than technical ones. "Technology is very seldom the problem," he says. "It's dealing with culture change." **CIO**

Got any stories about PSA software? Let Senior Editor Alison Bass know at abass@cio.com. Preston Gralla is a freelance writer in Cambridge, Mass.





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Case Files: Shell IT International

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COMPANY INFO

ORGANIZATION

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Houston

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2000 REVENUES

\$191.5 billion for the Royal Dutch/Shell Group

URL

www.shell.com

CHALLENGE

How to effectively manage the human side of change, through change agents, during an all-encompassing project

THE PLAYERS

JANET JONES

Project Manager

CHRISTY DILLARD

Change Agent in Shell's Individual Group Entities (IGE) division, the professional services arm of SITI

ANITA BETTIS

Change Agent from IGE

CASE ANALYST

GOPAL KAPUR

President, Center for Project Management

Quick Change Artists

How Shell Information Technology International successfully navigated the rollout of new security standards

BY SIMONE KAPLAN

WHEN THE I.T. SERVICES division of the Royal Dutch/Shell Group was required to implement a comprehensive set of new security standards in only six months, it decided to balance the human needs with the technical side of the changes.

In January 2000, the Shell Information Technology International (SITI) group received the mandate to institute all-encompassing security changes—new passwords every 35 days and updates to hundreds of servers and networks. As Shell's IT service provider, SITI had to make sure its 2,300 IT staffers knew the security standards inside and out by June, when an independent audit of the new standards would be performed. Unlike many IT projects, security changes impact the daily routine of every employee with the scope of the effect depending on the type of job. SITI therefore decided that this project, known as Trust Domain, called for a change agent.

Planning and Communication

The first thing Janet Jones, the SITI project manager who handled Trust Domain, did was panic. "I thought, Oh my gosh, how will we get this done?" Jones says. Then she sat with Trust Domain's sponsors and upper management at SITI and hashed out an overview of the project to determine what resources were needed. Jones decided to involve a change agent—keeping in mind that no one really likes change but that divisionwide compliance was imperative for the project to succeed. Past experience had shown that without a team leader focusing specifically on the people side of change, resentment might bubble up from the ranks. Alan Fraundorf, who was acting CIO for the organization at the time of the project and now works as a consultant in professional services, agrees. "You can have a great IT staff and extremely successful projects from an IT point of view," he says. "But you must deal with the organizational impact of



Shell change agents Anita Bettis and Christy Dillard (left and middle) helped project manager Janet Jones keep in mind the human impact of far-reaching security changes at Shell's IT services division.

PHOTO BY JENNIFER BINDER

change to have overall success.”

Jones knew it was essential to bring an agent on board early to ensure that project stakeholders were identified and that the communication between the project team and employees was quickly put in place. The agent had to have strong listening skills and an innovative approach to collaboration. Trust Domain came on the heels of the Y2K project, on which Jones had worked with Christy Dillard, a change agent in Shell's pro-

“Lots of people just stick their change agent in an office and leave them there. But you have to embed yourself into the project and the team.”

—CHRISTY DILLARD, CHANGE AGENT,
SHELL'S INDIVIDUAL GROUP
ENTITIES DIVISION

fessional services department in SITI. The collaboration had been a success, and Jones knew Dillard had the experience and the qualities she needed to manage Trust Domain. Once Dillard signed on, she brought over Anita Bettis, a second change agent from professional services. The three decided that Jones would handle the technical and project management tasks, while Dillard and Bettis would handle all communication with employees and act as liaisons between the project team and the SITI staff. In order for the SITI employees to trust the agents and take them seriously, Dillard and Bettis knew they had to be visible and accessible to the staff on a daily basis. So the two moved into the SITI offices and began sitting in on all group and department meetings.

“Lots of people just stick their change agent in an office and leave them there,” Dillard says. “But you have to embed yourself

into the project and the team. The change agents are the ones hearing about morale and reactions to the project.” Since Dillard observed people's reactions and Jones tracked the project's progress, daily meetings allowed them to share their different perspectives and create a larger picture. Jones, Dillard and Bettis immediately came up with

backbone documents for the project: a staffing piece and stakeholders' analysis.

Look into My Staff List

To have as granular an analysis as possible, Dillard and Bettis started by examining SITI's organizational chart and breaking it down

Continued on Page 99

EXPERT ANALYSIS

GOOD NEWS, BAD NEWS

BY GOPAL KAPUR

THIS IS A CLASSIC good news, bad news project. The good news: The team was able to finish the project on time and meet project objectives—supported by the fact that it passed the security audit with flying colors. The steps leading to the success of this project included a focused project manager, involved functional managers who defined project success up front, and the creation of the project website and mascot.

But of all the positive steps taken by project manager Janet Jones, the most important was recruiting the two change agents. Christy Dillard and Anita Bettis were innovative, effective, attentive listeners as well as good collaborators. They extended their effectiveness by recruiting unofficial leaders from each department as their project champions. Unfortunately, far too many project managers overlook the simple fact that any project by definition changes the way people do their work. In my experience, far too few project managers pay sufficient attention to the steps and effort needed to prepare the prospective end users for the change and overlook the need to recruit change agents early in the life cycle of the project.

In fact, few companies specifically employ change agents, and when they do, they are spread too thin and only act in advisory roles to the project manager instead of being full-time team members. Another key problem is that many change agents come from the IT department and end up acting as enforcers of the new process rather than as facilitators.

Now the bad news: This is a classic case of a project completed through the heroic efforts of the three team members—Jones, Dillard and Bettis. It appears that SITI and Shell do not have a well-defined repeatable project management process in place across the enterprise because none of the other Shell companies were able to pass the audit.

Far too many IT projects fail primarily because of poor project management discipline across the enterprise—a fact illustrated by the need to extend the project deadline to October for the remaining Shell companies—a 50 percent overrun from the original schedule.



Gopal Kapur is the president and founder of the Center for Project Management. An author of two computer-programming textbooks as well as numerous articles on project management in several business and technology publications, Kapur has been a consultant since 1975.

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- Only one entry per company will be considered.
- IT vendors, public relations and advertising companies, consultants and other third parties may NOT apply on behalf of another company. They are encouraged to forward the application to the "owner" of the system or to contact *CIO* Magazine to recommend that the client be contacted to fill out an application form.

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Continued from Page 94

by department, group and individual, examining the impact of the change based on the employees' jobs. Rather than simply filing the analysis away, the change agents used the document as a foundation for their communications plan—referring to it before meet-

ings or sending out memos. As the project proceeded and the effect of Trust Domain became clear, the agents added stakeholders to the list and used their feedback to modify the communications plan.

“Planning a change is like a three-legged stool. The legs are technology, process and people. To be successful, you need to have all three and have them appropriately balanced.”

—JANET JONES, PROJECT MANAGER, SITI

For Dillard and Bettis that meant meeting with a manager on a weekly basis or meeting with an individual employee to get internal feedback. The impact of the new standards varied. For some, it meant changing their passwords every month and making sure they had a screen saver on their desktop. For others, it meant changing the procedures for writing code and taking new precautions when dialing into SITI's network from a remote location.

To maintain contact with and solicit feedback from employees, the change team held frequent focus groups and took time in weekly department meetings for project discussions, where employees were more comfortable talking about concerns and questions. The team also looked to “unofficial” leaders in each department—the ones who spoke up most at meetings and employ-

ees went to for guidance. Jones and Dillard had learned during the Y2K project that getting the buy-in from those department leaders was essential in bringing along the entire department. The change agents met with the department champions for lunch on a monthly basis to keep their fingers on the

pulse of the unit. In turn, the department leaders kept the change team informed about how their group was adjusting to the new standards.

Trusty the Mascot

To increase awareness of Trust Domain, Jones and the change team created a website to keep staff updated and educated. The site featured project news, updates pertinent to each department, and a forum for questions and concerns. To bring the project to a more personal level and give it some humor, the team adopted a mascot: Trusty the porcupine. For the change team, Trusty gave the security project an identity that set it apart from other initiatives in SITI. To keep employees thinking about Trust Domain, which was essential for the project's success, the team saturated SITI with Trusty paraphernalia. All communications relating to the project, such as presentations, e-mails and memos, bore the porcupine's semblance, and Dillard set up an e-mail address for Trusty so that employees could e-mail concerns or questions about the project. Some people hated the mascot, she admits, but Trusty got people talking.

You Say Yes, I Say No

Inevitably, Dillard and Jones ran across pockets of resistance. Some employees felt

the new security measures were too little too late. Others had watched similar initiatives get pushed through in the past and fail. Often, the champions identified naysayers in their department to the change team and gave the team insight into why problems were occurring.

Dealing with reluctant employees meant that Dillard and Bettis constantly met with department managers and the naysayers themselves. The team sat down with resisters and listened to their concerns, and then tried to address them by discussing the goal of the security mandate. “If people felt the changes were ineffectual, we acknowledged their opinion but let them know we had to start somewhere,” Dillard says.

As a next step, Dillard got the resisters involved in Trust Domain by encouraging them to learn about the project scope and give presentations to other departments in SITI. This helped reluctant employees feel as if they were part of the team, and it showed other employees that if this person could support the project anyone could, says Dillard.

Secure the Hatches

When July 1 came, SITI passed the mandated independent audit of the new security measures. The audit represented the first real test to find out whether the Trust Domain project had succeeded. SITI was one of the only Shell business units to pass the audit. And although SITI had completed the project, so many of the other Shell companies failed that the Royal Dutch/Shell Group was forced to push back the deadline to Oct. 1 for implementing Trust Domain. For Jones and Dillard, the real success lay in watching the change come and go without fanfare and without disrupting office life.

“Planning a change is like a three-legged stool,” Jones says. “The legs are technology, process and people. To be successful, you need to have all three and have them appropriately balanced. By the time the change came, everyone was prepared.” **CIO**

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Staff Writer Simone Kaplan wants to hear your change management stories at skaplan@cio.com.

Tech-savvy schools like to share what they know—
but only if you learn how to ask **BY BEN WORTHEN**

From Their Labs to Your Desktop



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Tech-hunting CIOs should consider going back to school—not for extra credits, but for the tools to make their lives easier. Hundreds of colleges and universities offer access to research through their Offices of Technology Licensing (OTLs).

The University of California at Berkeley's OTL, for example, readily hawks The Pseudoflow Algorithm, a software component that promises to boost cross-supply chain query speeds anywhere from 25 percent to a whopping 32,500 percent. School reps will also tell you about the university's Mobile People Architecture, which formats communications (faxes, e-mails, phone calls) to fit just about any device. But both come with a caveat: They might not work in the real world.

University research has traditionally been more about theoretical rather than applied science. But an accelerating rate of practical innovation on campus—particularly in IT—means that CIOs willing to invest their time will find the effort worthwhile. On occasion, the payoff will be a new product or technology suitable for internal use. But even if they don't find something to run on their servers or connect to their networks, CIOs will almost always glean greater knowledge of what technology is coming down the pike. And that information can be valuable. Ashwin Rangan, CIO of Newport Beach, Calif.-based semiconductor maker Conexant, is unequivocal about his company's relationships with local research universities: "It is a source of a competitive advantage."

Historical Record

Much of today's information technology—everything from optical fiber to the Internet—originated in academic research. These innovations traditionally go through a lengthy commercialization process, however, where companies take the concept pioneered at a university and turn it into a viable product or service—and it can take years. But this situation is beginning to change. During the last decade a confluence of circumstances,

including a decrease in government research funding, industry's increasing need for innovation and a greater percentage of applied research in the universities, has pushed academic and commercial interests closer together.

To facilitate school-business relationships, most research universities have OTLs and industry liaison groups tasked with keeping corporations involved in on-campus research. OTLs deal with specific technologies, says Katharine Ku, director of Stanford University's OTL. Industry liaison programs, on the other hand, use newsletters, conferences and site visits to provide companies with a broader look at the research conducted across a university and to give members a chance to rub elbows with professors. Nearly 200 companies, including Ford Motor Co. and Pfizer, belong to MIT's Industrial Liaison Program, for example.

In the quest for new technology, companies work with schools in three ways: directly funding research; licensing a research-quality technology directly from the school; and funding graduate students or professors to start their own companies.

War Fund

The modern relationship between research universities and commercial interests dates from the end of World War II, when the military invested heavily in technical institutions—MIT and Stanford in particular. The goal was to develop innovative technologies that would help the United States win the Cold War. But most of the innovations in information technology from the '60s through the '80s were Defense Advanced Research Projects Agency (DARPA) projects, including the technologies that launched Cisco, Silicon Graphics and Sun Microsystems.

"Government saw it as their responsibility to fund research, especially that which might be relevant to the military," says Thomas Hughes, professor emeritus at the University of Pennsylvania and chair of the National Research Council's study on the funding of the computer revolution. "Until about 1980, the government was the major source of funds. Slowly, as the funding began to taper off, industry began to spend more."

The decline in spending coincided with the slowdown and eventual end of the Cold War. The Department of Defense still sponsors considerable academic research (the military gives about \$300 million a year to MIT's off-campus Lincoln Labs, for example). But sources for the remainder have changed significantly during the past decade.

Corporations, which had slashed R&D budgets during the economic slump of the '80s, returned to the university fold en masse, partly owing to the tech boom of the '90s. At MIT, the percentage of industry-sponsored on-campus research has increased from 10 percent in the beginning of the '90s to 20 percent today, or about \$90 million, says Karl Koster, the university's director of corporate relations.

Reader ROI

- Discover how companies use academic connections for technological benefit
- Learn how universities move research into the marketplace
- Find out how CIOs can become involved with academic research

Advanced Technology Development

Increased corporate involvement has coincided with a trend toward applied research meant to address real-world needs. During the Cold War, Hughes says, researchers received loose mandates and were allowed to address far-reaching theoretical problems. This free rein produced many well-known advances in computer technology, such as Unix, workstations and reduced instruction set computing (see "Academia's New Economy," Page 104). Today much of the computer science research conducted in universities uses real-world technology to address current problems, says Steve Halperin, professor and dean of the college of computer, mathematical and physical sciences at the University of Maryland (UMD) in College Park. Such projects could have a busi-

ness impact as soon as someone builds a commercially scalable version. As recently as a decade ago most university technology was at least five to 10 years away from commercialization.

The trend toward applied research, however, is not a direct result of increased corporate funding. The senate passed the Bayh-Dole Act in 1980 and a series of amendments in 1984 that for the first time granted universities commercial rights to technology developed with any degree of federal funding. Patenting innovations and finding a company that could license and develop the technology into a full-fledged product emerged as an important revenue source, says Stanford's Ku. And professors,

thus assured of retaining their intellectual capital, became more inclined to undertake applied research.

Technology License

The cheapest of the ways to actively benefit from university research is to license a promising technology and make it commercially viable. This approach, however, also takes the most internal effort, since a license is simply permission to use or commercialize a research-grade application and usually requires significant reengineering to make it enterprise-worthy. Conexant works with several universities, funds a wireless project at the University of California at San Diego and founded a student internship program with Kyungpook National University in Korea, among other things. In late 2000, says CIO Rangan, Conexant took a research-grade project-tracking concept and rudimentary application from University of California Irvine, which is just across the street from company headquarters.

The application went well beyond traditional project metrics like design and testing to include ongoing ROI calculations. But the software was far from business-ready. Rangan has five employees working on the project, which at this point doesn't have a definitive end date.

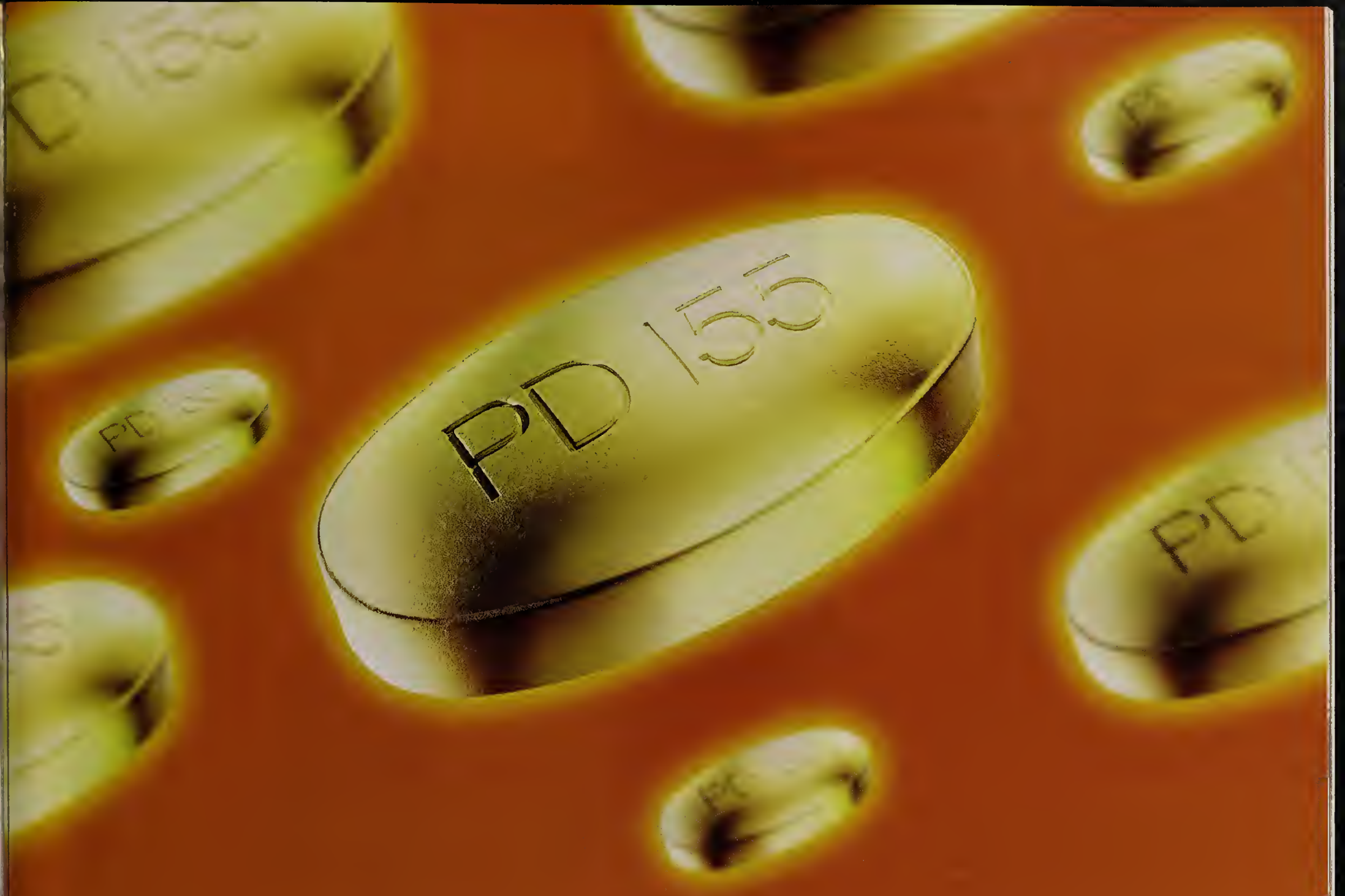
Making the application enterprise-ready has taken longer than Rangan expected, but he says that directly licensing a technology for internal use is a strategy he would pursue again if he found another technology that was production-worthy. In this case, the potential benefit from the system (not to mention the negligible monetary investment) made it worthwhile.

Fund Hunt

Providing the students or professors who developed a technology with funding to turn their research into a product is more expensive, but it requires less hands-on work. "Everybody thinks we're looking for the next new gadget to put in a car," says Chris Johnson, venture



Conexant CIO Ashwin Rangan sees his company's connections to local universities as a competitive advantage.



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Advanced Technology Development

fund manager with Ford in Dearborn, Mich. “[But] in the time I have been here we have done nothing for new vehicle technology. It’s been entirely manufacturing applications and enterprise applications.”

The automotive giant is a longtime member of MIT’s Industrial Liaison Program, and in June 2000 that foot in the door proved useful. Assistant Professor Matt Wall had developed a design-sharing technology that would work across CAD systems and allow companies to share only parts of a file. Now, with supply chain-wide collaboration coming closer to reality, Wall’s technology provided an opportunity for supply chain partners to team up while protecting their intellectual assets.

Ford decided to give Wall and his partners the funding he needed to develop a startup, Oculus Technologies, which would in turn sell the software to Ford. The software that came out of the university was rough, says Johnson. Ford did not want to license the software and turn it into something commercially viable itself—it would have cost too much money—but wanted to make sure that the product was developed with the automotive industry as a priority. Ford estimates that it will save \$5 million to \$15 million per vehicle design program through improved efficiency as a result of using Oculus’s system. “The technology might be two years out, but if we can get them an inside track we might be the first market they target,” says Johnson. “It has the potential to save millions of dollars for Ford, so the potential to save millions of dollars two years earlier is important.”

A Word from the Sponsors

Fujitsu, the Japanese software giant, combined the two approaches, both sponsoring research and working directly with the academics. This is a costly venture for Fujitsu but one with a high return.

During the past few years, the University of Maryland had made a concerted effort to align itself more closely with industry. “My belief is that the science colleges that will succeed in this century are those that learn

**Stanford Director
of Technology
Licensing
Katharine Ku:
Patents and
product
development
have become key
funding sources.**



Academia’s New Economy

THOMAS HUGHES, professor emeritus at the University of Pennsylvania and chair of the National Research Council’s study on the funding of the computer revolution, is afraid that the influx of corporate dollars and the trend toward applied research will prevent the monumental breakthroughs that characterized the computer revolution. “It is extremely important that universities have freedom to choose what projects to pursue and are not tied down to work on product-line improvements,” he says. “But I’m afraid that’s not the way a company would look at it.”

In private conversation, university heads complain about the constraints industry funding places on the school and that corporate dollars compromise academia’s ability to find the next big breakthrough. “I see this as a problem, a serious problem,” says Hughes. “Industry should look for talented researchers and have faith.”

Unfortunately, as Hughes accepts, that probably won’t happen. DARPA’s (Department of Defense’s Advanced Research Projects Agency) budget is staying right around \$2 billion for the foreseeable future, and the struggling economy forces industry to show a return for their buck. And the surest way to do that is with applied research. **—B.W.**

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to interact with a nonacademic world," says UMD's Halperin. "It is important for generating an inflow of new questions and ideas, and providing a link between our undergrad and graduate students and the outside world where most will find careers." Halperin's effort to attract businesses paid off in April when Fujitsu funded Professor Ashok Agrawala's Mindlab and occupied its own research facility literally next door.

Agrawala, whose previous research includes such projects as a real-time operating system that ran on any computer with a Pentium chip, started a dialogue with Fujitsu about sponsoring his current research, including wireless networking, in September

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2000. (At the time he was also speaking with Cisco.) The Mindlab research—software for wireless devices that combines multiple personalized services with location-sensitive information—was much more practical than his previous efforts. It was also in line with markets that Fujitsu hoped to pursue. "Basically what we wanted to do fit in well with what they wanted," he says. "There was very little tailoring [required]."

Unisys CIO John Carrow says the biggest advantages of university contact come from hiring students and tech trend watching.



Agrawala hopes to pilot his software soon at one of the Smithsonian museums, where visitors will be able to use rented Compaq iPaks to create their own gallery schedule agenda, make lunch reservations and purchase stuffed Spirit of St. Louis toy airplanes from the gift shop. The software allows devices to recommend exhibits based on user preferences and can even take advantage of location information to tell users when and in what direction they need to move in order to meet their friend for lunch.

Jonathan Agre, a director at Fujitsu Laboratories of America in College Park, says that before working with UMD, Fujitsu didn't have location technology. Now they have demonstration systems and are working on research papers. Agre thinks that Fujitsu could have location-based software on the market within two years.

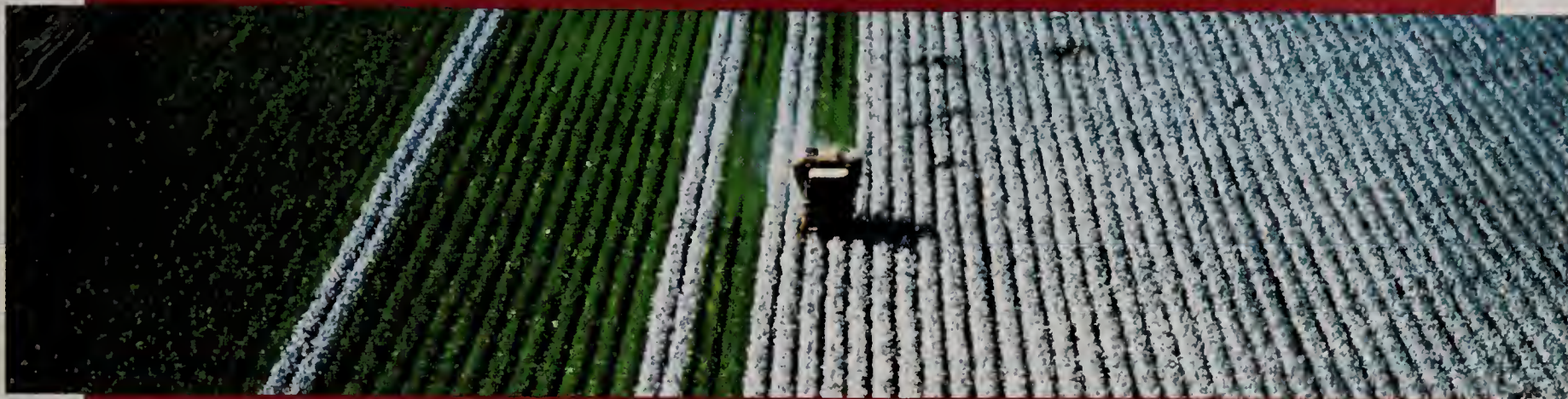
Fringe Benefits

John Carrow, CIO of Blue Bell, Pa.-based software integrator Unisys, says that the need for a solid relationship with universities has never been stronger. "[But] from a CIO's perspective, we are not looking five years out for technology," he says. "We want to implement things that are up to speed. I don't think many CIOs are in the R&D game. We want to help the business today." Although Unisys has worked with Villanova University, Drexel University, the University of Pennsylvania and Rutgers University on different projects, Carrow says that the biggest benefits are having an advantage when it comes to hiring former students and generally staying educated on emerging technology.

"CIOs are always interested in what is coming down the pike," he says. "And so knowing what is happening by staying close to university research helps you keep your company on the leading edge." **CIO**

Have you teamed up with a local university or college? Let Staff Writer Ben Worthen know at bworthen@cio.com.

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Edited by Christopher Lindquist. Send your thoughts and ideas for future columns to clindquist@cio.com.



Road Map to 3G

Wireless data will get a boost in 2002—but how much of one depends on whom you ask BY DANIELLE DUNNE

THIS YEAR, it looks like there will be a little high-speed wireless reality to go along with the hype. U.S. providers are finally beginning to roll out high-bandwidth wireless services, including e-mail with attachments, instant messaging and always-on data connections. And CIOs should be able

to take advantage of these tools—once they sift through the marketing jargon.

The wireless industry categorizes its technologies by stages of development. Analog networks (the first generation, or 1G) started the revolution. Digital wireless became 2G. High-speed

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data combined with advanced voice capacity is the third generation (3G). Back in the late 1990s, when it became clear that 3G network speeds were still years away, an interim stage called 2.5G emerged. This half step to 3G will happen this year, and many CIOs think that it will be sufficient—at least for the time being.

Nancy Bryant, CIO of 1st City Savings Federal Credit Union in Glendale, Calif., says that she is going to upgrade when the networks get faster. Bryant uses Sprint PCS's 2G wireless modems for backup support and out-of-the-office business, but faster would be better, she admits.

"We will probably go even faster than

2.5G speeds; if I could do it all wirelessly, I would," says Bryant.

Faster, Faster

Each wireless generational advance includes an increase in data speeds. Second-generation networks in general are slow, with data speeds similar to or less than a 14Kbps modem. Another 2G drawback is that the data connections are circuit switched—meaning users must initiate every connection. Both these issues, however, are partially solved by 2.5G networks. They use packet-switched networks, with an always-on data connection. And data also travels faster than on 2G networks,

with speeds similar to a 56Kbps modem. The Holy Grail of wireless—3G—ups the performance even further, purportedly achieving speeds as high as 384Kbps—fast enough to make multimedia features such as streaming video a possibility.

In the United States, the current stage is described as 2G moving toward 2.5G. (Europe and parts of Asia have an edge on the United States, with Europe well along 2.5G and Japan at or near 3G.) Most major wireless carriers say they are committed to building networks by the end of the year that can transfer data at average speeds between 40Kbps and 80Kbps. But just because the networks are capable of moving data at those rates does not mean users will always experience them (just as having "nationwide coverage" from your mobile voice carrier doesn't mean you'll always be able to make a connection).

And the faster speeds don't necessarily change the basic uses for wireless devices. With 2.5G, users won't be watching *The Matrix* on a PDA. But checking e-mail—and even opening attachments—which can be ridiculously time-consuming tasks on 2G networks, should become feasible. Downloading audio files and digital images may even be reasonable goals.

Two Ways to 3G

The simple generational names for wireless technology mask an ocean of complexity behind the scenes. For instance, when people talk about 3G they may be referring to either CDMA2000 or wideband CDMA (W-CDMA), both of which are competing technologies. (See "Wireless Glossary," this page, for a description of CDMA).

Both technologies describe different routes to full 3G capabilities. The CDMA2000 road to 3G includes a stop at 1x or 1xRTT (radio transmission technology), which promises average data speeds of 60Kbps to 80Kbps (at least according to Sprint PCS). Both Sprint PCS and Verizon Wireless say they plan to introduce their first 1x networks this year.

Here's where some confusion comes

Wireless Glossary

1XRTT: 1x radio transmission technology is the next step on the CDMA2000 path to faster wireless networks. This year Sprint PCS and Verizon Wireless plan to introduce the first phase of 1x networks that are capable of transferring data at average speeds between 60Kbps and 80Kbps, according to Sprint PCS.

1xEV-DV: 1x evolution-data and voice is the third step on the CDMA2000 path. When it becomes available (not until at least 2003) it will increase both voice and data capacity on the supported networks. Sprint PCS, which says it will introduce 1xEV-DV in 2004, claims the technology will transfer data at rates between 3Mbps and 5Mbps.

CDMA: code division multiple access technologies allocate bandwidth for users of digital wireless devices. CDMA uses codes to differentiate among multiple transmissions carried simultaneously on a single radio frequency band.

CDMA2000: encompasses all the stages of 1x technologies. It is considered a 3G technology that increases voice and data capacity and could theoretically provide data speeds up to 5Mbps. CDMA2000 3G technologies compete with W-CDMA technologies.

EDGE: enhanced data rates for global evolution is a step up from GPRS on the W-CDMA path to 3G technologies. EDGE is supposed to transfer data at speeds up to 384Kbps, but average performance may be slower.

GPRS: general packet radio service is a technology that sends packets of data across a wireless network at theoretical speeds up to 114Kbps. It is a step up from the older circuit-switched method as users do not have to dial in to networks to download information. GPRS is the next step for GSM networks on the W-CDMA path.

GSM: global system for mobile communications is a standard for coding and transferring data through the wireless spectrum. It is the predominant standard in Europe and Asia and is an alternative to CDMA. GSM digitizes and compresses data and sends it down a channel with two other streams of user data. The standard is based on time division multiple access.

TDMA: time division multiple access lets large numbers of users access one radio frequency. TDMA breaks down data transmission, such as a phone conversation, into fragments and transmits each fragment in a short burst, assigning each fragment a time slot.

W-CDMA: wideband CDMA is a 3G wireless technology that allows for high-speed, high-quality data transmission at speeds of around 2Mbps. Derived from CDMA, W-CDMA digitizes and transmits wireless data over a broad range of frequencies. It requires more bandwidth than CDMA but offers faster transmission because it optimizes the use of multiple wireless signals (unlike CDMA's one signal). W-CDMA competes with CDMA2000.

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in: The International Telecommunications Union (ITU) approved calling the first phase of 1x a 3G technology, and carriers are marketing it as such, but some analysts remain reluctant to call it true 3G. Average speeds for the first phase of 1x are closer to speeds characteristic of 2.5G networks. Phase two of 1x is the next step for CDMA2000 networks, which promises speeds up to 288Kbps—performance more in keeping with the 3G promise.

Meanwhile, the next phase of the W-CDMA path—the direction taken by AT&T Wireless, Cingular Wireless and VoiceStream—is general packet radio service (GPRS), but getting people to agree on GPRS data rates is difficult. The range for average data speeds wavers between 20Kbps (according to analysts) and 60Kbps (if you talk to the service providers). After GPRS comes enhanced data rates for global evolution (EDGE), which promises data speeds as high as 384Kbps, but average speeds may be slower.

How much slower these technologies are in the real world remains to be seen. The speeds that wireless data users actually experience are often significantly

Bakhshi, a research manager for 3G wireless infrastructure at Framingham, Mass.-based IDC (a sister company to CIO's publisher, CXO Media). While Bakhshi understands that 1x and EDGE have been called 3G by the ITU, it was on the grounds of theoretical speeds of 384Kbps—and users shouldn't expect that kind of performance in real settings.

Other Wireless Ways

Then there's a technology that doesn't fall neatly onto one route to 3G. Nextel's proprietary voice and data network, iDen, offers data speeds around 15Kbps to 16Kbps, and with compression technologies available this spring the speed could increase to between 40Kbps and 100Kbps, according to Nextel.

While the technologies certainly vary, for practical purposes the differences are all about speed and coverage. It's difficult to find concrete answers about speed, and coverage will vary according to each carrier's network. The entire Sprint PCS network, for instance, will upgrade to 1x at the same time halfway through this year, and the whole VoiceStream network is

The simple generational names for wireless technology mask an ocean of complexity behind the scenes.

lower than the theoretical maximums. Actual performance depends on a number of factors, including a user's location and how many other people are on the network at the same time.

The achievable speeds for 1x and EDGE, for instance, are much lower than their theoretical speeds, says Shiv K.

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already at GPRS. Other carriers are moving market by market and making advanced services available in some areas they cover but not in others, which could be an issue for CIOs looking to implement nationwide wireless data services. (AT&T and Cingular say they plan to have national coverage by the end of 2002, with Verizon claiming it will achieve almost complete coverage in the same time frame.)

The endgame, true 3G in the form of either W-CDMA or 1x evolution-data and voice (1xEV-DV)—the CDMA2000 technology—is still a few years away. In the meantime, CIOs who are already using

Companies to Watch

Red-M

BLUETOOTH, the wireless "cable replacement" technology, has a foothold overseas, but it still faces an uphill battle in the United States. That hasn't stopped Red-M, a Bluetooth networking vendor based in Wexham, England, from giving the market a try.

The company builds a variety of Bluetooth-related products, including access servers, which manage a Bluetooth wireless network; access points that connect enabled devices to each other or to an existing network; and the Blade, which adds Bluetooth to HandSpring and Palm Vx PDAs.

Bluetooth has yet to make significant gains in the United States, where 802.11b wireless has become the hot technology, but Red-M still has hopes for its success. Bluetooth offers networking at much lower power levels, making it ideal for smaller devices such as PDAs and cell phones. The company also offers a suite of "wirelessware" products, collectively called Genos, that let companies implement and manage multiprotocol wireless networks (including Bluetooth and 802.11b). Using Genos, companies can control user access, establish quality-of-service guidelines, set policies on what devices receive which content, and allow users to roam among various wireless networks seamlessly.

For more information, visit www.red-m.com.

—Christopher Lindquist

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2G wireless data technologies say the faster the better. Analysts think the next step, 2.5G or similar services, will be fast enough to satisfy most data users, unless they are trying to stream video to their phone. But why would someone want to watch a video on such a small screen?

"No one will tell you that fast is too fast, but for most of the applications we are going to be using over the next year, the speeds we're going to have will be fine," says Ken Hyers, a senior wireless analyst at

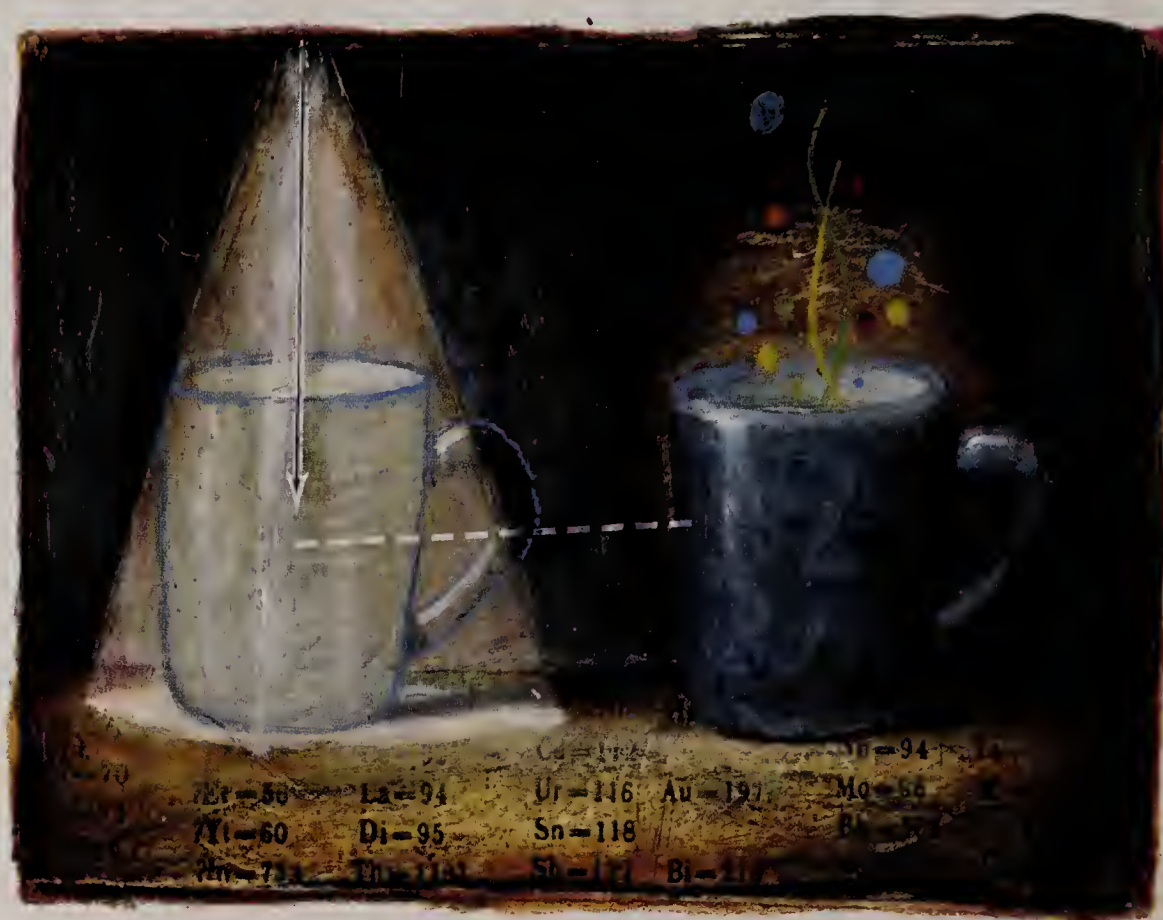
The faster speeds don't necessarily change the basic uses for wireless devices.

Newton, Mass.-based Cahners In-Stat Group. Unless you want to use wireless technologies to stream video, there's no reason to wait for 3G, says Hyers, who doesn't think we'll see true 3G until 2005.

Faster is always happier, agrees Jim Cogliano, COO of The Sullivan and Cogliano Cos., a Waltham, Mass.-based IT staffing company that has 50 reps using Nextel's mobile data services to sync up to their Outlook accounts via wireless phones. Cogliano says his current speed isn't bad.

There's still a lot of skepticism about these faster networks actually materializing. Santosh Patel, director of service operations for North America at Honeywell in Morristown, N.J., has 1,400 technicians using a wireless field service automation application on a combination Cingular 2G network and Wireless Matrix satellite network. "Data speeds around 56K will open up more possibilities, and 3G will open up even more," says Patel, "but I'll believe it when I see it." ■

Danielle Dunne is editor of CIO's Wireless Communications Research Center.



UNDER DEVELOPMENT

Advanced physics

Quantum Leap

A QUANTUM physics breakthrough could turn pipe dreams, such as ultra-high-speed quantum computers and teleportation, into real-world technologies.

Eugene Polzik and his coresearchers at Denmark's University of Aarhus have managed to raise the mysterious concept of quantum entanglement—a link between two or more particles that have no physical contact—to an unprecedented scale. The team gathered two clouds of cesium gas, each containing about a trillion atoms, into separate, sealed vessels. They then shined a laser through both clouds. For a split second, the clouds became entangled, and magnetic changes in one instantly affected the other. The previous entanglement record was a mere four atoms.

The development could lead to the creation of computers and communications networks that operate much faster than anything that's available today, says Peter Handel, a physics professor at the University of Missouri in St. Louis. "Information encoded in photons could be transmitted to places without sending them across space," he says. Quantum entanglement could also allow matter to be transported from one location to another by instantly duplicating the properties of one object in another place.

Other researchers, however, are skeptical about quantum entanglement's sci-fi aspects. "You can't transfer information faster than the speed of light, that's an immutable law of physics," warns Randall Hulet, a physics and astronomy professor at Rice University in Houston. Yet Hulet is confident that quantum science will eventually be able to provide tangible IT benefits. "Quantum mechanics' promise lies in things like unbreakable codes and computers that run exponentially faster by operating in multiple states rather than step-by-step," he says. "Quantum entanglement is significant, but it's also important not to get carried away by things."

—John Edwards

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Computer-aided visualization looks to bring data to life

BY FRED HAPGOOD

MOST DAYS of the week we are as sober as judges, but we can be tempted. In April 1993 we proved the point by eloping with a looker by the name of visualization. "Soon...visualization will become the foundation for business planning, intuitive analysis, bilateral decision making and the creation of value," we wrote. And not 10 years down the road either. "Vision's time," we announced, "has come."

The promise that seduced us was the potential of developing striking, memorable, novel, visual metaphors for business processes and using those metaphors to make monitoring and managing those processes simpler, faster and more intelligent. If that could happen, managers would be able to push collaboration to new levels of complexity, work with much larger volumes of data and do intelligent sorting through huge solution spaces. We liked this prospect a lot. "Visualization tools are the most important information

technology since the typewriter," we said.

Nine years later it seems safe to say that this proposition still sounds a bit sweeping. True, the commodity end of data visualization—bars, pie charts, line graphs—did get a lot cheaper and easier, but pie charts don't do much that can't be done with text. We had something more ambitious in mind.

To be fair, those ambitions have come close to realization in a number of specialized sectors, including cutting-edge CAD programs such as Graphisoft's ArchiCAD that allow building visualizations that architects can use for design, marketing for virtual reality tours, contracting for construction scheduling, and finally, when the building is complete, managing assets and facilities by tenants and agents. Farmers routinely build maps of their fields that represent chemical applications and crop yields on a yard-by-yard basis. Mechanical engineers use kinematic visu-



Ethernet

PREDICTIONS

Ethernet all the Way

A SOON-TO-BE-released standard could have significant ramifications for bringing Ethernet to the local loop or "last mile," according to a recent report by Cahners In-Stat Group.

The report notes that a working version of the IEEE 802.3ah standard, which looks to spell out Ethernet broadband access topologies for both fiber and copper, should be in place by the end of 2002. When it arrives, the report states, it should bring a number of advantages, including network simplicity, reduced infrastructure costs, increased bandwidth per dollar of infrastructure and easier provisioning. These benefits should make Ethernet an attractive alternative to T1, T3, frame relay, ATM and Sonet access technologies, the report says.

Ethernet in the last mile faces bigger hurdles in the consumer market, however, where entrenched cable and DSL providers may not be inclined to implement the new technology, at least in the near term, according to In-Stat. The Ethernet technologies must also work well over copper wire, as very few residential customers have fiber running to their homes.

For more information, visit www.instat.com.

—Christopher Lindquist

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alizations to test tolerances and clearances. Medical imaging is a continuing miracle.

However, it is worth noting that almost all this progress has taken place with data already possessing a spatial character. All visualizations are fundamentally metaphors: Each element has to stand for something. No matter how powerful a visualization might be, if that connection is not obvious to its users there is no point to the product. Pie charts worked because people came to them already understanding the difference between small and large slices of pie. Spatial data is inherently obvious in the same sense; it is easy to understand what it means to walk around inside a virtual building because we have so much experience walking around real buildings.

own image processing and then generalizing from that vocabulary. He is hopeful that a new science called vernacular geography, the study of geospatial metaphors in everyday life (as in such phrases as "over the hill," "around the bend" or "ain't no mountain high enough") will uncover the building blocks for this advance.

On the other hand, Tony Crescenzo, CEO of Illumitek, a visualization company in Herndon, Va., suspects another solution might lie in industrial-strength interactivity. He points out that if a system can transform complex data quickly enough, it doesn't matter what the visual metaphor is (within reason), since the interactivity makes it easy to match data with onscreen objects and therefore makes

is the environment right for real progress in the art. (In addition, many companies now use storage networks that can pool their data with just a couple of mouse clicks.)

This emphasis on interactivity is leading some engineers to look for visual metaphors in the most highly interactive sector of the IT culture—computer games. "In practice, visualization is mostly about presenting changes in complexity that vary with time," says Stephen Eick, CTO of Visual Insights, an e-business performance company based in Naperville, Ill. When his company started to design its products, the employees asked themselves what experiences their target market had with representations of that sort. The answer would have been obvious to any CIO, especially on Friday night, during the interdivisional *Quake* tournaments.

Eick suspects that the right vocabulary of commercial visualization will be very gamelike, rather like the vision of the matrix in William Gibson's prophetic *Neuromancer*. Users, individually or in collaborations, will hover over data landscapes, zip down or up through levels of resolution, and transform them with a gesture. (Visual Insights has such faith in that vision that it built its products on the Microsoft Game API; in theory, the products could run on the Xbox.)

With some extrapolation, one could imagine that competitors will appear as the zombie reptiles from Xork, to be dispatched by lethally innovative product designs. Maintenance efficiencies will add or subtract vitality points. Players can spend procurement savings on magic armor or gas arrows. Promotion ladders will weave in and out of virtual environments—today a vice president, tomorrow, a wizard of the first rank.

This may sound like a trick to keep employees working 80 hours a week, but before we get upset let's first see if anybody complains. **CIO**

Fred Hapgood is a freelance writer based in Boston. He can be reached at hapgood@pobox.com.

Visualization in the sense of an advanced interface makes sense only when it addresses very large amounts of data.

For visualization to be as important as the typewriter, the technology has to work where the spatial aspects of the data in question are either irrelevant or do not exist at all. These latter applications raise the old problem of finding a happy compromise between ease of use and power, between finding metaphors that are both easy to learn while delivering unprecedented levels of information density.

Some observers think the right path to visual computing is finding or designing new metaphors. Bob Jacobson, CEO of Modern Visualization based in Burlingame, Calif., suspects that inventing better visualizations might well depend on uncovering the fine details of how the brain does its

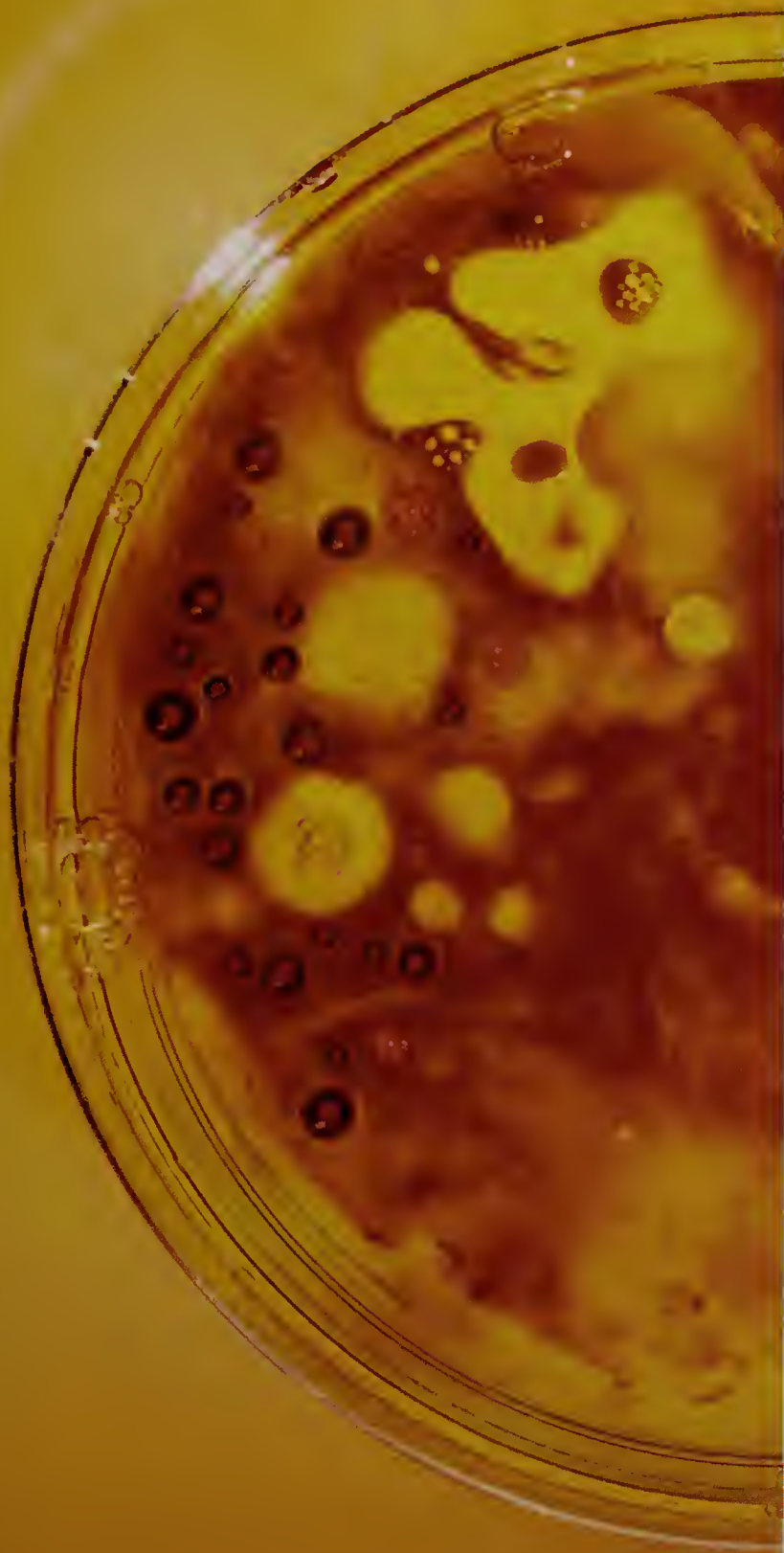
that metaphor easy to learn. Higher interactivity also makes it easy to extend the power of familiar metaphors.

Visualization in the sense of an advanced interface, however, makes sense only when it addresses very large amounts of data. (Simple, cheap and familiar representations—bar charts, for example—exist in abundance for smaller data sets.) For most of the past decade the costs of the storage of even a modest number of gigabytes and the computational resources required to manipulate them quickly imposed a price level that was prohibitive for all but the most value-laden applications.

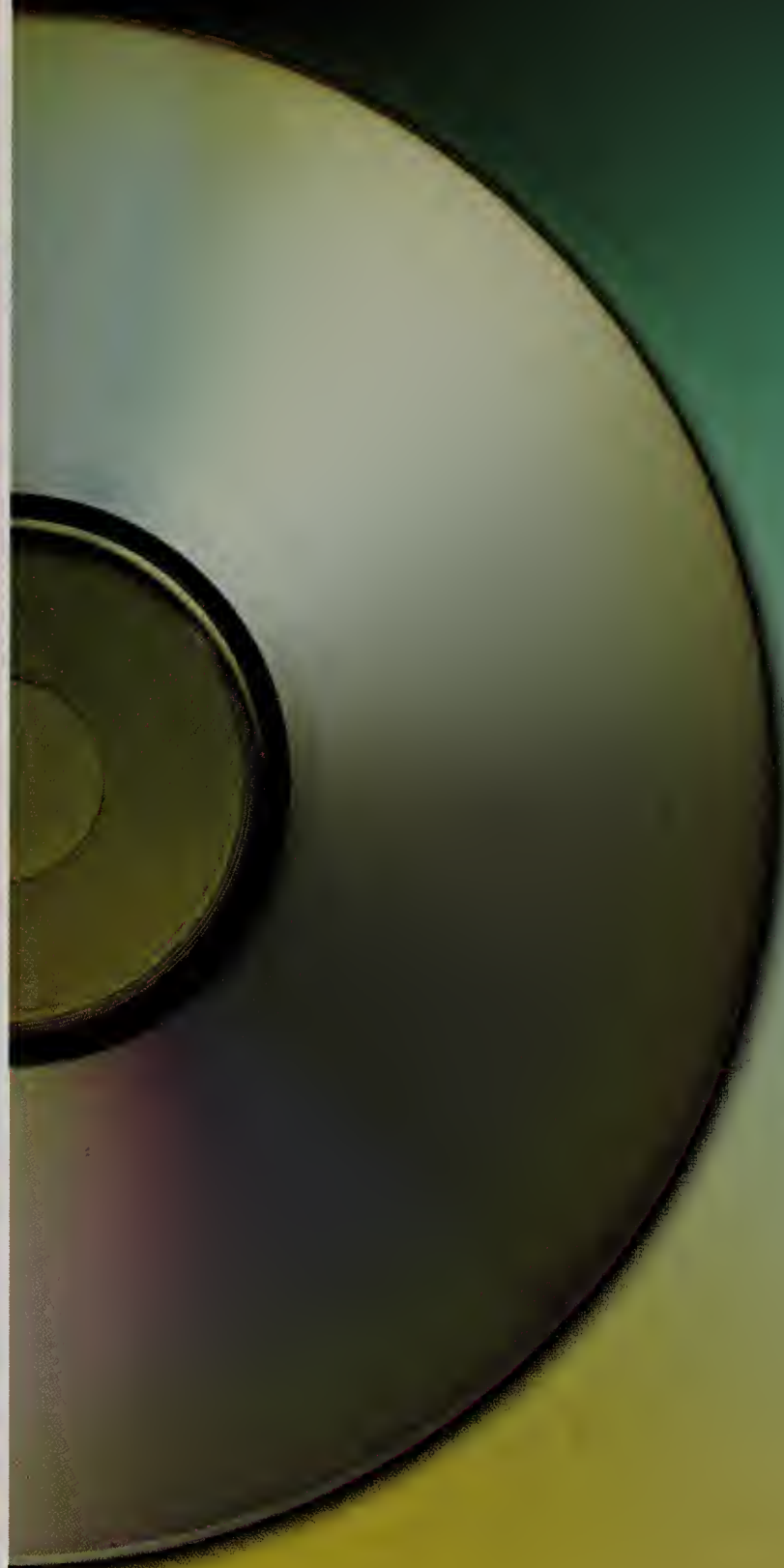
In addition, until recently data compilations often entailed pulling scattered and usually incompatible databases together, adding programming costs on top of that. Crescenzo thinks that only now, when it is practical to think in terms of clusters of 2GHz processors running on top of data warehouses containing tens of terabytes,

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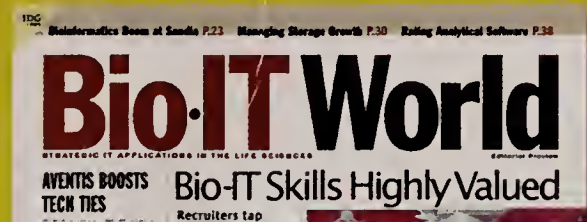


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Ask the Expert

Advice from people who know

Gearing Up for Globalization

Katarina Bonde, CEO of technology provider Glides, addressed readers' questions on CIO.com about the challenges of globalizing and localizing Web content

Q: About a year ago I was promoted to corporate webmaster. My predecessor and I developed a plan whereby all offices would use one Web development tool, and templates would be distributed along with guidelines for development and presentation. Despite the fact that international offices would still be able to manage their own content, the policy has never passed owing to internal politics. Lacking an executive mandate for centralization, most international Webs are now on ISPs, developed and maintained via a myriad of products and technologies. My team must now develop and maintain separate toolkits (templates, guidelines and so forth) for both centrally served Webs and those on the remote servers. Can you provide any insight on how best to steer this into a more manageable situation?

A: Many companies struggle with similar problems. On the one hand, they want to maintain content along with brand consistency, accuracy in multiple languages and a turnaround time of Internet speed. On the other hand, they have to deal with time differences when communicating between offices, poor Internet connections in many countries and few resources that



slow down the workflow processes to a trickle. Most regional offices have special promotions and seminars that are time-sensitive and specific to their regions. They want to offer only relative information that caters to their specific regional audience. They also need to be concerned with the speed of connection between the international offices and their websites. Subsidiaries become frustrated with long turnaround times, inability to tailor content for regional audiences and slow connection to nonregional websites. The corporate office knows the problems exist, but it can't find a solution. When the office weighs the benefits of controlling brand consistency and accuracy against time to market, the decision often made is to let the subsidiaries go off on their own. It all boils down to the corporate office golden rule: Don't impede sales.

So, how do you get to a more manageable situation? Show them an affordable, centralized content management solution

ILLUSTRATION BY ROBERT NEUBECKER



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Ask the Expert

that gives them significant improvement on turnaround time by streamlining the workflow processes. The important part is for the platform to allow remote users to edit, review and publish content that they are responsible for. The solution should also give them the ability to maintain content along with brand consistency and accuracy in multiple languages, but the flexibility to address regional issues by tailoring the content for regional audiences and publishing to regionally located Web servers.

Companies need to remember that the Web is inherently global.

Q: What are the key technologies that prepare a website for the global environment?

A: Companies need to remember that the Web is inherently global; when a company launches a website, it is accessible by a worldwide audience. While there are no technologies that prepare companies for the global environment, there are things they need to consider and architecture constraints they need to keep in mind. For example, high-speed connectivity is not as prevalent internationally, so don't design your site with the T1 audience in mind. Or at least offer a version of the site that minimizes bandwidth-intensive components.

From a network design standpoint, consider mirroring your servers in key geographic locations to provide an increased response time to your international visitors. This mirroring can easily be accomplished through conversations with your ISP. Finally, companies need to consider languages when addressing a global audience. Studies show that people are significantly more responsive when addressed in their native tongue. Consider which languages make the most sense for your company and add them only when you are able to effectively handle communication from that region. However, sometimes a really good way to test and cost-effectively get feedback from a potential target market is to create a version of your site for that market, in that language, and drive traffic to the site through remote campaigns. A key component of a multilingual website

is translation and content synchronization. Be sure to thoroughly evaluate content management tools with a special emphasis on multilingual content.

Q: Must all websites in a company look the same? We have three separate sites, and all perform different functions but are related to the same general subject matter. The sites share a common but very wide-ranging audience: management, nonmanagement, technical users, nontechnical users and so forth. The three sites were created at different times and have differing volumes of users. My supervisor feels that we should standardize these sites. Other than pleasing my supervisor, what are the benefits of standardizing departmental websites? Should they look exactly the same? How much does it really benefit us to undertake this effort?

A: Whether to standardize the look and feel of multiple websites depends on your company's branding strategy and the purpose of the different sites. There are a number of benefits to standardizing websites. For example, companies can manage content and development tools easier and faster with fewer staffers and standardized content management tools. Standardizing also allows you to repurpose that content so you have to enter the content only once and can use it for multiple purposes.

Studies show that people are significantly more responsive when addressed in their native tongue.

The other consideration is branding. If your company has a strong brand identity or is attempting to build a strong brand identity, standardizing the look and feel of multiple sites will help. A website's appearance is part of that brand identity: The more that "look and feel" is seen, the more that identity is reinforced. In most cases, it is better to standardize to help build the company's brand identity and take advantage of easier, faster content management tools. The company wins all around.

However, sometimes that can be a disadvantage. For example, if your company has a strong brand identity that people associate with high-end quality products and the company is about to introduce a low-end product line, both products might suffer by association. Instead, the company may choose to create a new brand identity for the low-end product line. **CIO**

To suggest topics for this column, contact Senior Editor Daintry Duffy at dduffy@cio.com. Katarina Bonde is president and CEO of Bellevue, Wash.-based Glides, a Web globalization technology provider.

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Ask the Expert

Have a question about IT certification?

MICHAEL CLIFTON, chief operating officer of Boston-based Nobilis Software, will be available through March 31. Post your questions at www2.cio.com/CIO/expert, or e-mail them to asktheexpert@cio.com.

communication from that region. However, sometimes a really good way to test and cost-effectively get feedback from a potential target market is to create a version of your site for that market, in that language, and drive traffic to the site through remote campaigns. A key component of a multilingual website



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- **LEADERSHIP AND COMMUNICATIONS** Get the results you want — from senior management, peers, and employees.
Dr. Rick Brinkman, author, *Dealing with People You Can't Stand*
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AND an interview on the role of the CIO in a changing environment with Kevin Turner, CIO, Wal-Mart Stores.





Strategies for the New Reality

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SUNDAY, APRIL 14

8:00 am – 1:30 pm

Golf Tournament

3:00 pm – 5:00 pm

Registration

6:00 pm – 8:00 pm

Welcome Reception

Meet your peers, CIO editors, Corporate Hosts and speakers.

8:00 pm – 10:00 pm

A Night @ the Improv

Hosted by Information Builders, Inc.

MONDAY, APRIL 15

7:30 am – 8:30 am

Breakfast & Registration

8:30 am – 8:45 am

Welcome & KnowPulseSM Poll

ABBIE LUNDBERG

Editor in Chief, CIO Magazine

8:45 am – 9:30 am

Opening Keynote: Is There Such a Thing as Too Much Security?

JONATHAN

ZITTRAIN, Conference Moderator
Executive Director, The Berkman
Center for Internet & Society,
Harvard Law School

The push toward a more secure Internet has been revitalized by recent events. Just what forms will that security take? Implications reach far beyond combating viruses and denial of service attacks. Almost every way we use the Internet, especially for commerce, stands to evolve, as "security" and "trust" become the touchstones of Internet development.



9:30 am – 10:15 am

CIO & CFO: Working Together for Better Results

NEIL HASTIE

CIO, TruServ Corporation

CORLISS (CORKY) J.

NELSON

Senior Executive Vice

President & CFO,

Ryder System, Inc.

The CIO and the CFO are the two executives whose domains stretch to every corner of a company — as IT is woven through every aspect of the organization, and bottom-line concerns exert greater influence on all initiatives. Regardless of where they sit on the organization chart, the two will always have a unique relationship — one inevitably colored with tension. A CIO and CFO look at the nature of the roles, and discuss how to strike the right balance between an appropriate amount of tension and respect — and why doing so will produce better corporate results.



10:15 am – 11:00 am

Keeping Up with Emerging Technologies in Turbulent Times

CHARLES S. BRENNER

Senior Vice President, Fidelity

Center for Applied Technology

The hardest part of a CIO's job is trying to keep up with emerging technologies. Companies must decide whether or not to invest in new technology development.

Fidelity Investments is one company that has continued to invest heavily in innovation.

Brenner explains why his com-



pany believes that an economic downturn is the ideal time to make investments in new technology: because by the time the markets rebound, it may be too late to develop the new technologies and services your customers demand before your competitors do. He also talks about some of the actual technology directions Fidelity is currently pursuing.

11:00 am – 11:30 am

Break

11:30 am – 12:15 pm

Business Briefings

Our Corporate Hosts present case studies, technology updates, and management practices.

12:15 pm – 1:45 pm

Working Lunch: The Economy — A Special Report

ROBERT J. SHILLER

Professor of Economics,

Yale University

In his best-selling book, *Irrational Exuberance*, Shiller documented the combination of factors that drove stock markets to dizzying heights, and forecasted the dangers associated with that phenomenon. The dot.com bubble burst, the economy quickly slowed—and the events of September 11th continue to take a heavy toll psychologically and economically. Where do we go from here?



2:00 pm – 3:30 pm

Business Briefings

3:45 pm – 4:45 pm

CIO Panel: Rethinking IT and Business Strategies

Moderator: RICHARD

W. SWANBORG, JR.

President and Founder,

ICEX

Panelists:

JOHN GLASER

Vice President and CIO,

Partners HealthCare

System, Inc.

ED GLOTZBACH

Executive Vice

President and CIO, SBC

Communications Inc.

How do you keep your IT strategy relevant and visible while your business undergoes significant change? How do you improve the speed for setting an IT strategy and getting buy-in from all your stakeholders? Is there a better way to fund and quickly deploy a new strategic initiative while minimizing the risk of failure? Top CIOs share their views and experiences.



4:45 pm – 5:45 pm

Legal Liability: When You and Your Company Can Be Sued

BRUCE P. KELLER

Partner, Debevoise & Plimpton

To what extent are you and your company exposed based on how employees or third parties interact with your IT systems? Do you know what your systems are really hosting? A number of corporations recently discovered that their systems functioned as "super nodes" for the FastTrack file-swapping network. Keller examines how current



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concepts of organizational liability, privacy and intellectual property use in the marketplace affect corporations.

6:00 pm – 7:00 pm

Reception

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TUESDAY, APRIL 16

7:30 am – 8:30 am

Breakfast & Informal Discussion Roundtables

Chat with *CIO* Magazine editors and your peers over coffee.

8:30 am – 8:45 am

Corporate IT Spending Trends — Where Are They Headed?

GARY BEACH

Group Publisher, CXO Media Inc. *CIO* Magazine, in partnership with Ed Yardeni, chief investment strategist of Deutsche Banc Alex.Brown, surveys a panel of senior executives on current and future IT spending. Beach presents an overview of the latest results and emerging trends.



8:45 am – 9:45 am

New Tools, New Approaches to E-Crime: A US Secret Service Briefing

BOB WEAVER

Assistant Special Agent in Charge, US Secret Service, NY Electronic Crimes Task Force. The Task Force's approach is unique in law enforcement because of its focus on prevention, education and partnership with



private industry, as much as its responsibilities for investigation and support of prosecution. Weaver, and Peter Cavicchia — one of the members of his New York team who is specially trained by the USSS to handle electronic crimes — provide specific practices and techniques used by the NY Electronic Crimes Task Force to combat electronic crimes, including forensics techniques, technology tools, and approaches the Task Force takes that are mutually productive for business as well as law enforcement.

This session is produced in cooperation with the National Critical Infrastructure Assurance Office (CIAO) in the US Department of Commerce.

9:45 am – 10:45 am

Best Practice Exchange: Setting, Selling and Managing the IT Budget

Moderator: MARTHA HELLER
Director, Best Practice Exchange, *CIO* Magazine
BRIAN BERTLIN
CIO, Washington Group International
WILLIAM A. CROWELL
Former CIO, Meredith Corporation
JOHN NORDIN
Vice President & CIO
A. M. Castle & Co.
TIMOTHY WRIGHT
CIO, CTO & Senior Vice President, Global Technology
Terra Lycos
CIOs who want to see their projects completed and their staff



intact understand the importance of smart budget practices. This panel of CIOs, drawn from the *CIO* Best Practice Exchange, a private online network of senior IT executives, discusses the tools and techniques CIOs can use to set, sell, and manage their IT budgets.

10:45 am – 11:15 am

Break

11:15 am – 12:45 pm

Business Briefings

1:00 pm – 2:30 pm

Networking Lunch

2:45 pm – 3:30 pm

The Role of the CIO in a Changing Environment

A Special Interview with:

KEVIN TURNER

Executive Vice President & CIO, Wal-Mart Stores, Inc.

Turner shares his personal experiences and reflects on the role of today's CIOs in this interview with Editor in Chief Abbie Lundberg



3:30 pm – 4:30 pm

Leadership and Communications

DR. RICK BRINKMAN

Author, *Dealing With People You Can't Stand...*

As CIOs gain more prominence within their organizations, they have more opportunities to interact with other senior executives, corporate officers and directors. Dr. Rick helps us understand the cause/effect of communications and get the results we want.



4:30 pm – 5:30 pm

Closing Keynote X-Engineering: The Next Frontier

JAMES A. CHAMPY

Author, *X-Engineering*

the Corporation, Reinventing Your Business for the Digital Age

James A. Champy's radical rethinking of the corporation shows it not simply as a single collection of processes turning out goods and services, but rather as part of a web of interacting processes that include those of every organization involved in producing what the company sells. His new book, *X-Engineering the Corporation*, comes at a time when managers must look beyond reengineering and cross ("x") boundaries they've never crossed before. The way to thrive defies all previous models; it's the next frontier for dramatic business performance improvement.



5:30 pm – 5:45 pm

Summary/Conclusions

JONATHAN ZITTRAIN

5:45 pm – 7:00 pm

Keynote Reception

7:30 pm – 9:00 pm

CIO Dinner Under the Stars





Strategies for

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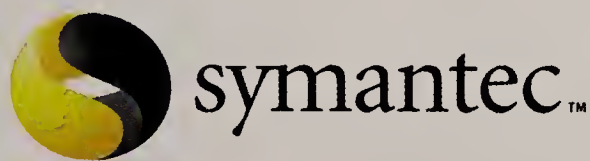


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EXECUTIVE Summaries

March 15, 2002

COVER STORY | Legacy Systems Migration

By Simone Kaplan | 56

Despite the contracted economy and its concomitant budget cutbacks, now is the best time to modernize or migrate legacy systems to meet the demands imposed by the Web. The expense of legacy system maintenance is bilking companies for more than it would cost to migrate to thin-client systems or connect legacy apps to Web front ends. American International Group, for example, determined it would save 30 percent of what it was spending on maintenance if it moved from mainframe to thin client. Part of the positive equation is that thanks to new tools and techniques, migration costs have come down. In 1996, for example, insurance company PMI Group calculated the cost of legacy system modernization at about \$20 million, less than the estimated cost of the potential service-related failures that could result if the systems remained in place. In a 1999 estimate, that migration bill came down to just \$12 million. Liking those numbers, PMI joined other companies in seizing this opportunity to throw off the legacy albatross, and it will finish its overhaul by fall 2002.

“Legacy applications are a cancerous problem that need to be excised. It’s not a choice. If your business is changing, your systems have to change.”

—DAVID R. GUZMAN, CIO,
OWENS & MINOR

Cyberterrorism: Not So Threatening

By Scott Berinato | 66

SINCE SEPT. 11, THREATS ONCE CONSIDERED digital aggravations have been tagged cyberterrorist provocations. The term has lost its meaning in the mouth of fear mongers. Cyberterrorism, according to the National Infrastructure Protection Center, is an act perpetrated through computers that results in violence, death and/or destruction, and creates terror for the purpose of coercing a government to change its policies. To qualify as cyberterrorism, an act must have a political motivation and a destructive result. Most cyberattacks satisfy only the first criterion. It’s far less likely than the media would have us believe that cyberterrorists could cause destruction. More credible is the danger to critical data: a cyberterrorist who hacks critical computer systems to steal or irreversibly damage vital data, such as the Social Security database. The good news for CIOs is that protecting against any security threat protects against cyberterrorism.

Security Response Plan

By Sarah D. Scalet | 74

KNOWING HOW TO RESPOND TO A SECURITY INCIDENT can save companies time, money and even their reputation. But incident response planning is one of those best practices that rarely gets done because it’s viewed as costly and it’s an admission that something could go wrong. The first assumption is incorrect, and the latter is deadly accurate, as evidenced by FleetBoston and other organizations forced to put their plans into action. Unless a company creates a dedicated team for security (not always necessary), a response plan is cheaper than most CFOs would think. The first step is pulling together key staff to form an incident response team. There must be a centralized process to report, respond to and track incidents. A key element of the plan is deciding who’s in charge of response and which people can pull the plug on the website or network.

Workflow Software Problems

By Preston Gralla | 84

PROFESSIONAL SERVICES AUTOMATION SOFTWARE automates assignments, billing and invoicing, time sheets and similar kinds of labor germane to professional services companies. The systems help a company closely track what work employees are doing and see at any given moment how resources are being used—all the better for deploying the workforce. Problem is, employees often balk at using it. Frustrated CIOs have learned that to make the software pay off, they must start with a thorough understanding of their company’s corporate culture and how the company assigns work. They need to capture how employees report their progress on assignments, note time spent on each project and bill for their work. Most fundamentally, the intended users must be convinced up front that the benefit is worth their cooperation.

Corporate and University Research Partnerships

By Ben Worthen | 100

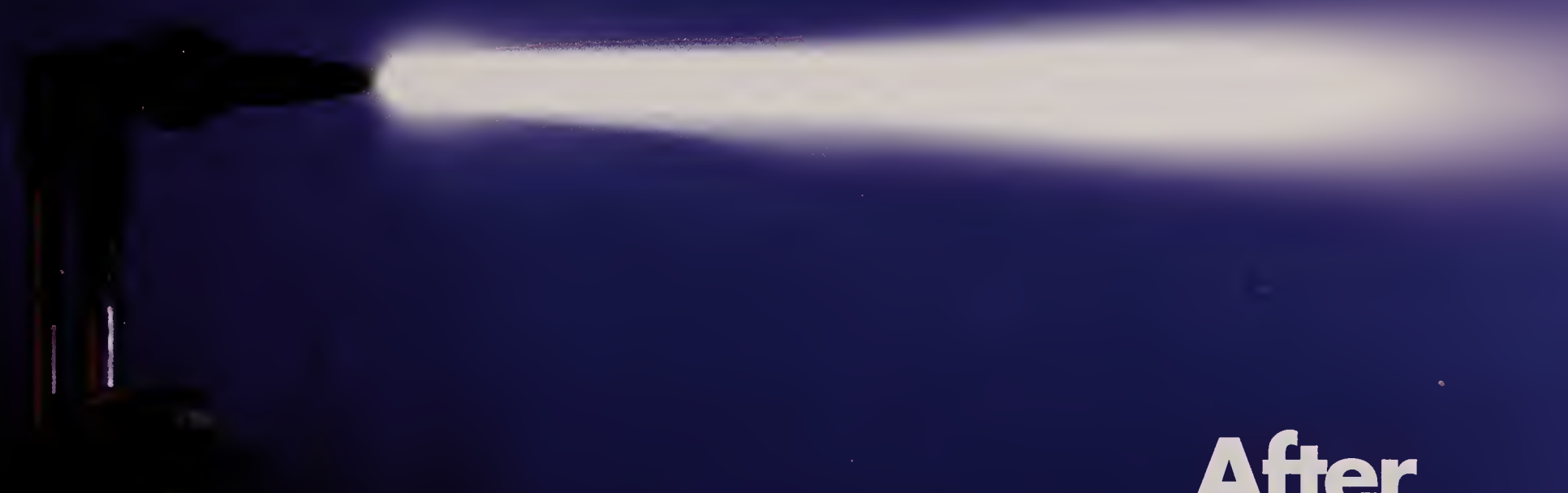
CIOs WILLING TO INVEST THE TIME CAN TAKE advantage of the accelerating rate of practical IT innovation happening in university research labs today. The payoff could be early access to new products or technologies—and real competitive advantage. Hundreds of colleges and universities offer access to research through their Offices of Technology Licensing. Companies work with schools in three ways: directly funding research; licensing a research-quality technology directly from the school; and funding the graduate students or professors who created the research so that they can start their own companies. Ford funded a professor at MIT to develop a company around a university-developed design-sharing technology that works across CAD systems and allows companies to share only parts of a file—keeping other sections hidden.

Workforce Productivity

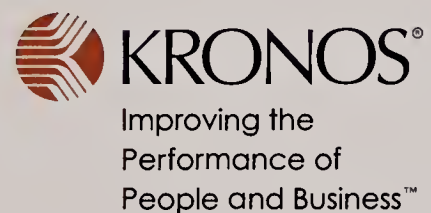


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